March 1984

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sinclair user

INCORPORATING **SPECTRUM USER**

Issue No 24

FREE SOFTWARE BOOKLET

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SIR CLIVE'S NEW BABY

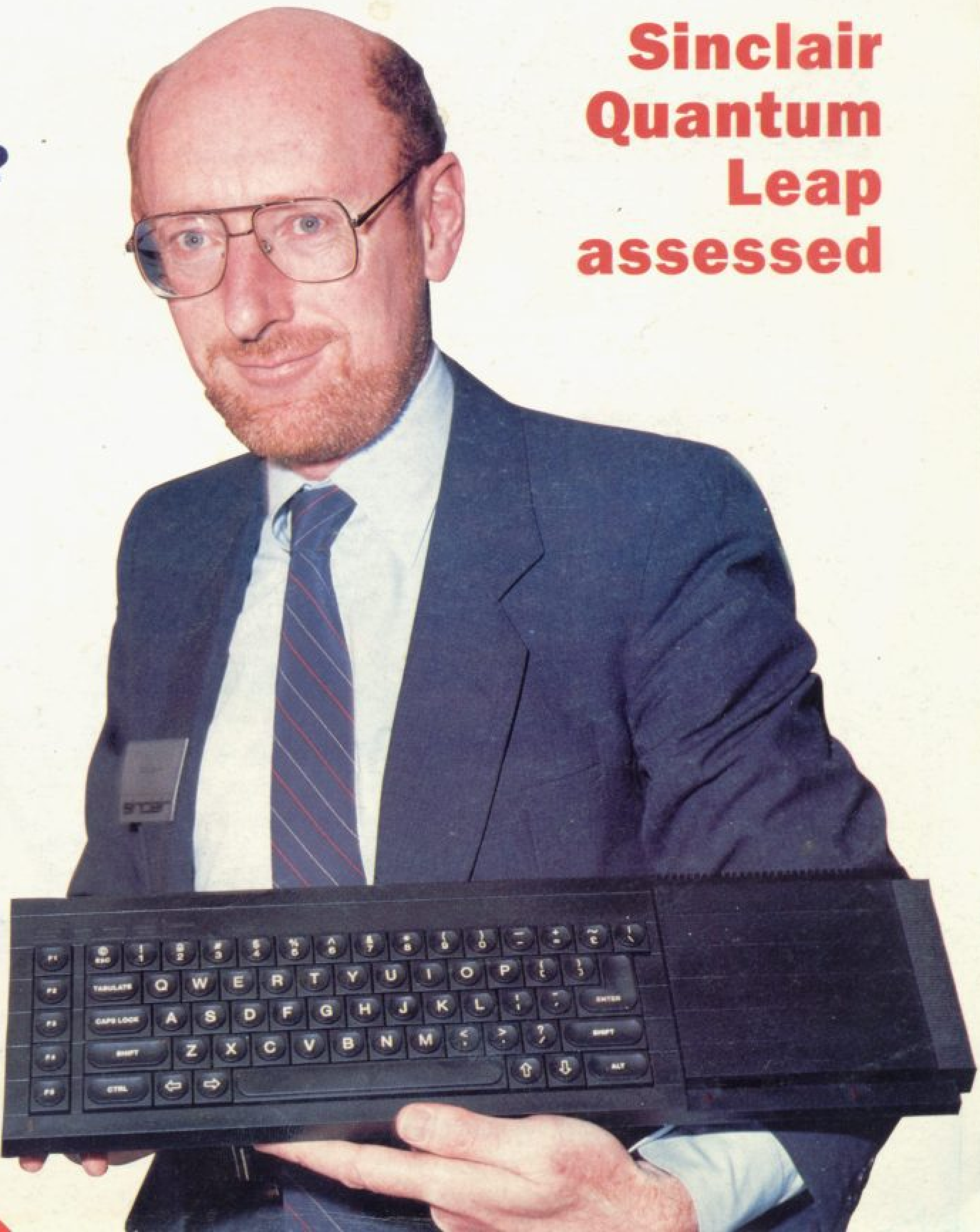
Cartridge software— is it worth it?

Computer programs on probation

Forth— the human dimension

Special offer on Sinclair Software

Sinclair Quantum Leap assessed



WIN A ROBOT



With the vast range of games now available for home computers each holds a different challenge. Now the Kempston Competition-Pro Joystick will come to your aid and improve your playing capabilities. Your movements will become quicker, your finger poised over the fire button at the ready, your scores will be out of this world. Playng will be easier.

If you're serious about the challenge your computer presents then you shouldn't be without the Kempston Competition-Pro Joystick.

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Allows the use of any Atari/Commodore type Joystick with the popular ZX Spectrum computer. A must for any Spectrum owner who wants the power of a joystick added to the power of the Spectrum. Simply plugs into the edge connector at the back of the Spectrum. No modifications necessary. Only £14.99

If you have the hardware you'll want the software . . .

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All games 16K unless otherwise stated

All the above games simply load and play with the Kempston range of Joysticks. However, some games available were produced before Joysticks were available for the ZX Spectrum. With the aid of Kempston Conversion Tapes these games can now be played with the Kempston Joysticks.



Conversion Tape I
– Converts: Horace Goes Skiing, Hungry Horace, Flight Simulation (Sinclair), Arcadia, Penetrator, Spectres.

Conversion Tape II
– Converts: Orbiter, Escape, Tanx, Centipede, Spectral Invaders, Cruising on Broadway, Frenzy.

Conversion Tape III
– Converts: Ah Diddums, Jumping Jack, Molar Maul, Androids, Horace And The Spiders, Space Raiders, Winged Avenger, Muncher.

ALL £4.95 each

Most items are available from W H Smith, Boots, Spectrum Computer Centres and good computing shops or direct from:

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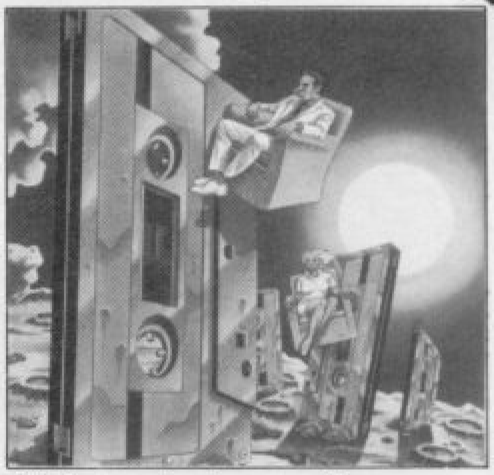
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Soft Centre review insert page (i)

NEXT MONTH

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TECHNICAL DETAILS
SCOPE is a fully structured multitask language specifically for writing graphics, animation and sound. Being fully compatible with BASIC it is ideal for writing both arcade and adventure style games. Additionally, with SCOPE present in high memory it can be used as an assembler with SCOPE words as plain language mnemonics. Therefore no knowledge of machine code is required. The language is extremely easy to comprehend and is very powerful indeed providing many features not available from BASIC.
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Quantum Leap in the dark

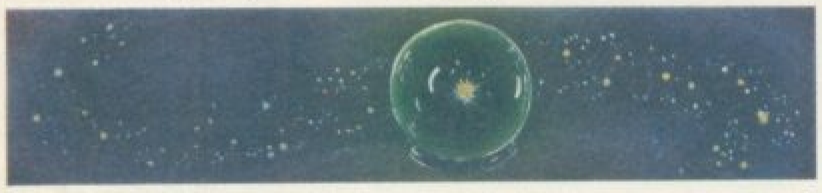
THE LAUNCH of the QL business machine has shown not only that Sinclair Research can produce machines for the upper end of the computer market but that it can produce a machine which, it claims, is well in advance of anything available for less than £2,000.

The launch of the Spectrum two years ago left the computer industry stunned at the ability of Sinclair to predict what would work in the market. The journalists at the launch even gave a standing ovation to Sir Clive.

The introduction of the QL, or Quantum Leap, has been slightly different. There was no applause at the launching of the machine and it still remains to be seen whether the silence was in awe or not, but nobody can dispute that Sinclair has effected the rest of the industry in such a way that it will have to think carefully before making its reply.

It must be said that Sinclair marketing strategy, which seems poor or non-existent to some people, has played a role in the company's success. So far, Sinclair has launched and advertised computers and peripherals well in advance of stocks being available. Some sceptics are already saying that it will not be until late this year that the QL will arrive in the stores.

Sinclair has been so consistent with its method of mail order selling that there may be something behind the technique. In the world of marketing, scarcity creates demand, rather like the scarcity of diamonds or gold. The more difficult it is to obtain a computer, the more eager potential users become to



possess one. That was true of the Spectrum to some extent and it was certainly true of Interface One and the Microdrive, which appeared more than one year after they were first announced and are still not available generally.

It might also be asked why Sinclair launched the QL in such a hurry and at a time when there is a dip in the market after Christmas. There were no initial stocks of the machine and the manual was half completed. The answer seems to be that the company wanted to attack the BBC Micro and Commodore 64 in the serious sector, as well as pre-empting the new Commodore and IBM business machines which were launched a week later.

When the QL was launched Nigel Searle, managing director of Sinclair Research, stressed that the company did not know in which direction the QL would go. It might attract more of the business market, go towards educational markets, or become a glorified games machine.

Sinclair also said that about the Spectrum but immediately countermanded the idea by producing a range of games programs. The company has done the same thing with the QL. It has a range of software packages on Microdrive which are more applicable to the business sector of the market.

There is no doubt that the QL can be compared favourably to machines which touch the £1,000 mark at least. The 32-bit processor chip helps provide a computer far in advance of most machines on the market. It is a multi-tasking computer, so it can run several programs or routines at the same time.

The QDOS operating system in the QL also marks it apart from other machines costing less than £1,000. It runs the Microdrives and includes many graphics utilities to help the user produce programs which are simple to write but powerful when run.

The machine has certain deficiencies which Sinclair Research says will be remedied later. Compared to the BBC, it is not equipped to take disc. Even when an interface has been added, Sinclair Research says that it will support Winchester discs which are very expensive and, in most cases, bulky.

The printer interface for the standard QL is the serial RS232C. Most other computers, such as the BBC, support the Centronics parallel interface which has a faster data transfer rate. Again, Sinclair says that a parallel interface will be made available in the near future but the question is when? The business user is unlikely to want to wait a year.

Some good news from Sinclair Research is that every user who joins QLUB, a club for QL owners, will receive notification of new products through a newsletter and compensate for the communications problems which occured between users of the ZX-81 and Spectrum and the company. That may mean that users will have their technical questions answered, which is not happening at the moment. Club members will also be able to take advantage of any offers available.

No matter what happens to Sinclair, the market as a whole will change dramatically in the next year. Many software companies will not be able to approach the quality software which the QL will demand. It will be the bigger companies, already geared with development systems, which will make the all-important and risky first attack on the QL customer.

That is not to say that everybody else should pack up and go home. The lower end of the market, consisting of machines like the Electron and Spectrum for less than £200, will continue to provide value for money. Those machines will be bought by people who do not want to spend £400 to learn about computers or to play games.

Magazines, such as *Sinclair User*, will also have to make changes to accommodate the QL. Not only will features covering the new machine need to be written but they will have to follow a new style to which the more serious computer user will be accustomed.

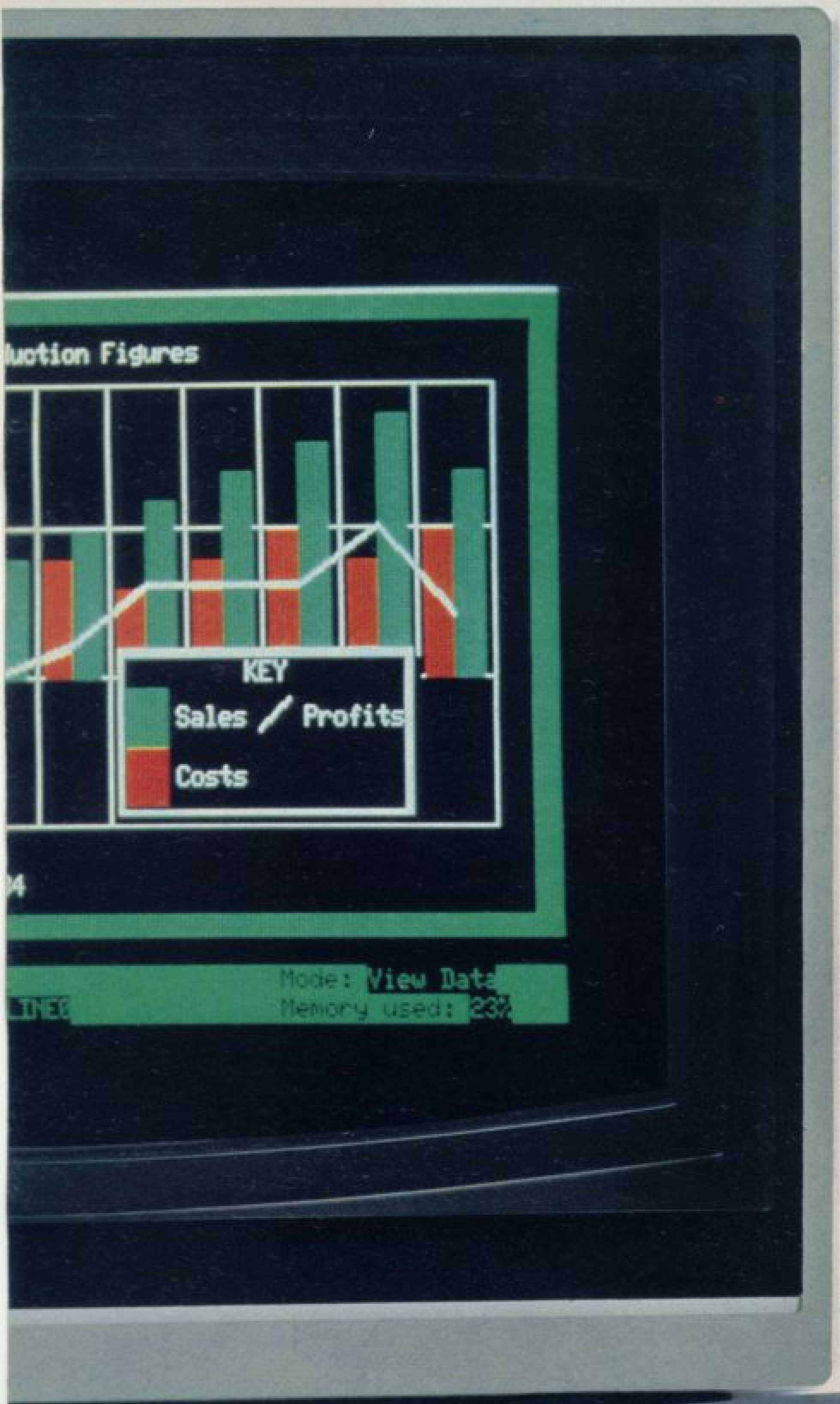
Whatever happens in the next year, those who are willing to take advantage of events will create a computer boom the like of which has never been seen previously.

Investors' complaint

RUMBLES of discontent about profit by investors in Sinclair Research have been penetrating the company's joy bubble. According to Sinclair, such comments as have been made have been distorted out of proportion.

Many investors have complained that they are not getting what they expected — and the operative word is expected. Sinclair Research is a company which is always ploughing into new areas. To do so it needs money and Sir Clive made it clear when shares were sold that some of the profit would be applicable to research. Sinclair is not, after all, just a marketing company. It is from the research that investors will eventually receive their profit.

New-Sinclair QL
There's no comparison chart, b



The Sinclair QL is a new computer.

Not just a new Sinclair computer, but a totally new sort of computer – nothing like it exists anywhere.

It's not just a bit better than this, or a bit cheaper than that – it's a computer that's very hard to compare with anything. Just check the features below – and if you don't agree, take up the challenge at the end of the advertisement.

If you do agree, there's only one course of action you can take... get yourself a Sinclair QL at the earliest possible moment.

The Sinclair QL has 128K RAM. Big deal?

Several micros offer 128K RAM, or more, as standard. The 'What Micro?' table for December 1983 lists over 50 of them – but 40 of the 50 micros listed cost over £2,500!

The Sinclair QL offers you 128K RAM for under £400, and an option to expand to 640K. That's a lot of bytes to the pound!

The Sinclair QL has a 32-bit processor. Who else?

Under £2,700, nobody. Even the new generation of business computers, such as the IBM PC, are only now beginning to use 16-bit processors.

At prices like this, the Motorola 68000 family – widely regarded as the most powerful microprocessors available – will remain a luxury.

Yet with the Sinclair QL, the 32-bit Motorola 68008 is available for less than £400.

You can also be sure that the QL will not become outdated. 32-bit architecture is future-proof.

32-bit processor architecture, 128K RAM, and QDOS combine to give the QL the performance of a mini-computer for the price of a micro.

Exclusive: new QDOS operating system

No competition! QDOS sets a new standard in operating systems for the 68000 family of processors, and may well become the industry standard.

QDOS is a single-user, multi-tasking, time-sliced system using Sinclair's new SuperBASIC as a command language.

One of its most significant features is its very powerful multi-tasking capability – the ability to run several programs individually and simultaneously. It can also display the results simultaneously in different portions of the screen. These are features not normally available on computers costing less than £7,000.

Eleven input/output ports

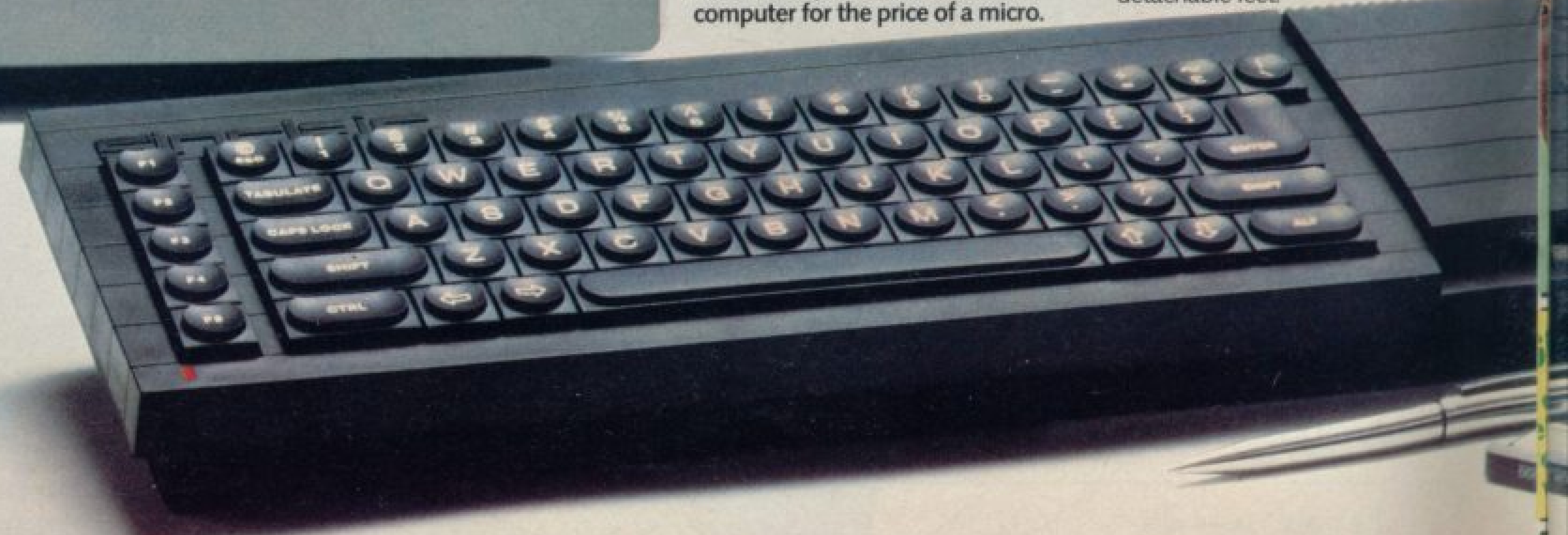


New professional keyboard

The QL keyboard is designed for fast input of data and programs.

It is a full-size QWERTY keyboard, with 65 keys, including a space bar; left-and right-hand shift keys; five function keys; and four separate cursor-control keys – key action is positive and precise.

A membrane beneath the keyboard protects the machine from dust (and coffee!), and for users who find an angled keyboard more comfortable, the computer can be raised slightly at the back by small detachable feet.



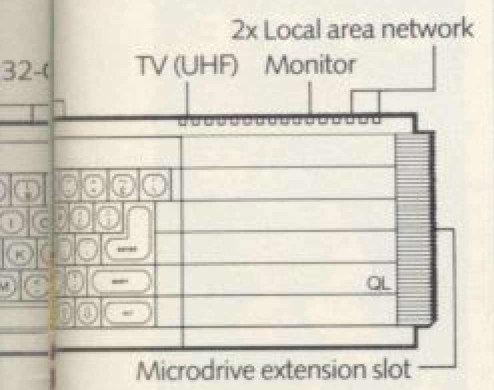
£399

because there's no comparison!

Advanced new friendly language – Sinclair SuperBASIC

The new Sinclair SuperBASIC combines the familiarity of BASIC with a number of major developments which allow the QL's full power to be exploited.

Unlike conventional BASIC, its procedure facility allows code to be written in clearly-defined blocks; extendability allows new procedures to be added which will work in exactly the same way as the command procedures built into the ROM; and its constant execution speed means that SuperBASIC does not get slower as programs get larger.



Two 100K microdrives built in

The Microdrives for the Sinclair QL are identical in principle to the popular and proven ZX Microdrives, but give increased capacity (at least 100K bytes each) and a faster data-transfer rate. Typical access speed is 3.5 seconds, and loading is at up to 15K bytes per second. The Sinclair QL has two built-in Microdrives. If required, a further six units can be connected.

Four blank cartridges are supplied with the machine.



Included – superb professional software

The suite of four programs is written by Psion specially for the QL and incorporates many major developments. All programs use full colour, and data is transportable from one to another. (For example, figures can be transferred from spreadsheet to graphics for an instant visual presentation.)

Word-processing

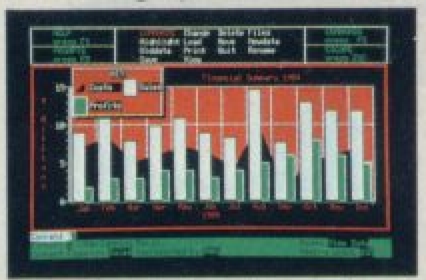


Certain to set a new standard of excellence, QL Quill uses the power of the QL to show on the screen exactly what you key in, and to print out exactly what you see on the screen.

A beginner can be using QL Quill for word-processing within minutes.

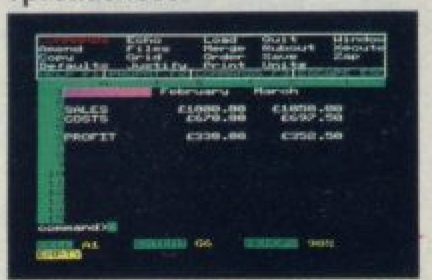
QL Quill brings you all the facilities of a very advanced word-processing package.

Business graphics



QL Easel is a high-resolution colour program so easy to use you probably won't refer to the manual! It handles anything from lines, shaded curves or histograms to overlapping or stacked bars or pie charts. QL Easel does not require you to format your display before entering data; it handles design and scaling automatically or under your control. Text can be added and altered as simply as data.

Spreadsheet



QL Abacus makes simultaneous calculations and 'what if' model-construction easier than they've ever been. Sample applications are provided, including budget-planning and cash-flow analysis. QL Abacus allows you to refer to rows, columns and cells by names, not just letters and numbers. Function keys can be assigned to change a variable and carry out a complete 'what if' calculation with a single key-stroke.

Database management



QL Archive is a very powerful filing system which sets new standards, using a language even simpler than BASIC. It combines ease of use for simple applications – such as card indices – with huge power as a multi-file data processor.

An easy-to-use labelling facility means that you don't have to ask for your file by its full name – a few letters are enough.

New – the Sinclair QLUB

The QLUB is the QL Users Bureau. Membership is open to all QL owners. For an annual subscription of £35, QLUB members receive one free update to each of the four programs supplied with the QL, and six bi-monthly newsletters. Sinclair has also made exclusive arrangements for QLUB members to obtain software assistance on QL Quill, Abacus, Archive or Easel by writing to Psion.

The Sinclair QL challenge

If you're seriously considering any other computer, post the coupon for a blow-by-blow comparison. We'll take a *published* comparison chart for the machine you're considering (not one we've created ourselves) and give you the Sinclair QL figures, detail by detail.

Take action today!

To order by mail

– complete the coupon and send it to the FREEPOST address below. For credit card holders it may be possible to extend your credit limit. Full details will be sent when we acknowledge your order.

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Please do not use this number for other enquiries.

For more information

Phone Camberley (0276) 686100, or use the coupon to get a QL brochure.

Please allow 28 days from receipt of order. Remember that Sinclair offers a 14-day money-back undertaking.

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	Sinclair QL Computer	6000	399.00	
	QLUB membership (one year)	6100	35.00	
	Postage & packing (any order over £390)	6999	7.95	

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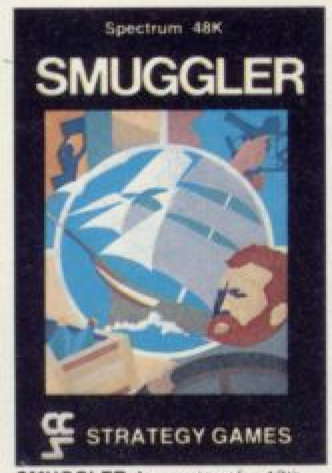
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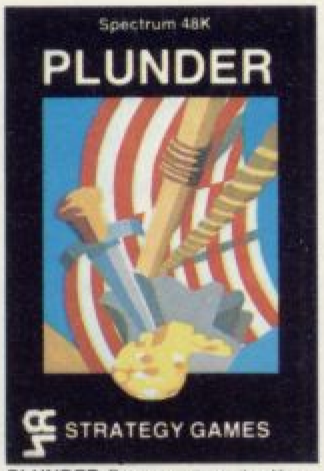
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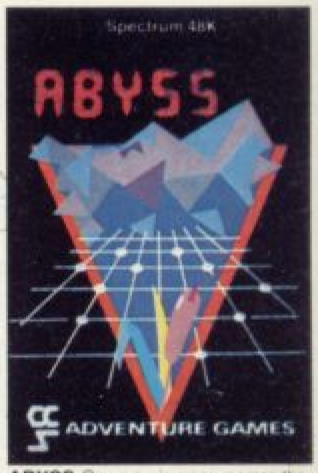
AIRLINE A wing and a prayer will not be enough to turn your £3 million to £30 million in the time allowed, but your financial wizardry will enable you to take over British Airways, or will it? Runs on ZX81 16K — £5 and Spectrum 16K/48K — £6.



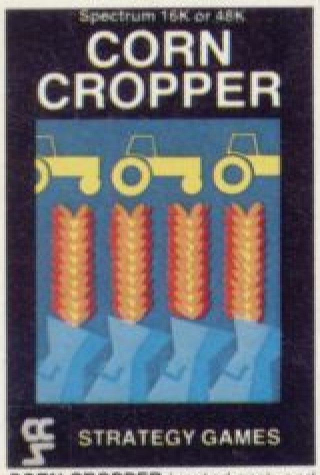
SMUGGLER As master of a 19th century vessel you plough between England and the continent visiting ports to buy and sell your cargo, but beware the customs men, pirates and gale force winds can all run you aground. Runs on Spectrum 48K — £6.



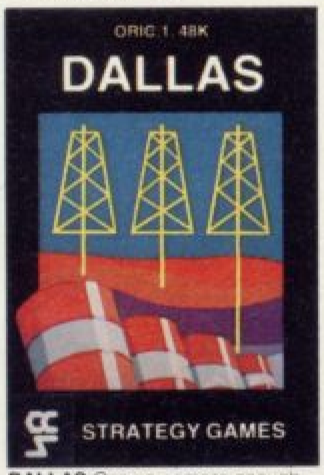
PLUNDER Can you singe the King of Spain's beard. Engage the Spanish ships on the high seas survive their broadsides and plunder the gold destined for the Armada and you might get your Knighthood before Francis Drake. Runs on Spectrum 48K — £6.



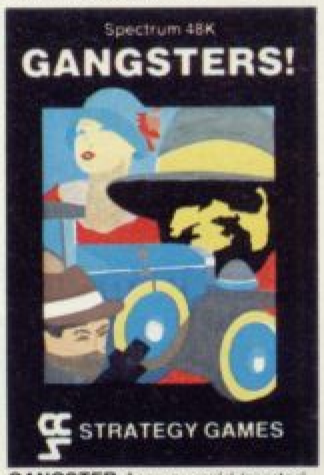
ABYSS Can you journey across the long-forgotten Abyss and outwit the evil monsters that lurk in the shadows awaiting the foolhardy and careless adventurer. There are many bridges and many monsters. Will you be the one to make the Abyss safe to cross again. Runs on Spectrum 48K — £5.



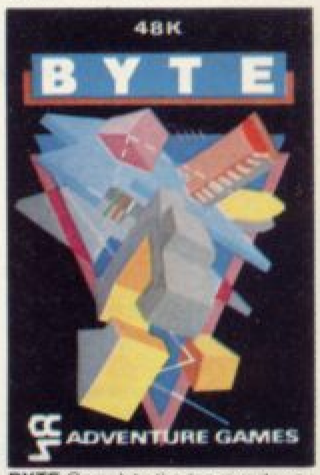
CORN CROPPER Limited cash and droughts are two of the problems facing the farmer. Planting fertilizing and harvesting must all be done economically if you are to reap the rewards offered in corn cropper. Runs on ZX81 16K — £5 and Spectrum 16K/48K — £6.



DALLAS Can you amass enough petro dollars to take over the Euing empire. Cut throat business and an eye for the main chance may get you there but you'll need nerves of steel to become the oil king of Dallas. Runs on ZX81 16K — £5 and Spectrum 16K/48K — £6.



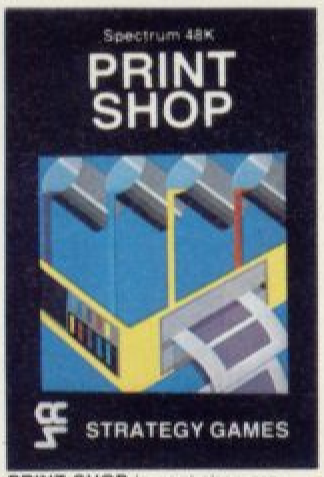
GANGSTER Are you cold hearted and callous enough to warrant the title of Don. You need to be if you are to rise to the top of the pile. A quick trigger finger and an even quicker brain are needed to control the mobs and their rackets. Runs on Spectrum 48K — £6.



BYTE Complete the ten circuits you need to build your computer system then return home. Easy. Byte has sent its electronic monsters to harry you through this three dimensional maze of circuitry, if any of them catch you . . . Runs on Spectrum 48K — £5.



AUTOCHEF You have a million in capital and need to increase this to £25 million in the shortest time possible. Inflation, strikes, sluggish markets are only some of the hazards to overcome. Runs on ZX81 16K — £5 and Spectrum 16K/48K — £6.



PRINT SHOP In print shop are scheduling, staffing, purchasing and quoting within this time limit will test your business acumen to the full and weekly balance sheets will prove the quality of your decision making. Runs on ZX81 16K — £5 and Spectrum 16K/48K — £6.



BRITISH LOWLAND You are given a racing start for your small sports car company but you have an overdraft to repay and a workforce to be kept happy. Steer your way to success with careful management and industrial relations. Runs on Spectrum 48K — £6.



CAMELOT As the banished Arthur Pendragon you must find seven treasures without falling prey to the Brigands, Dragons and Evil Magicians that stand in your way and make a triumphant return to Camelot to be crowned King. Runs on ZX81 16K — £5 and Spectrum 48K — £5.

Available from W H Smith, Boots, Rumbelows and all good computer shops or Cases Computer Simulations Ltd., 14 Langton Way, London SE3 7TL.

Strategy Games. They're no pushover

"AMAZINGLY FAST SERVICE - YOU'VE KEPT IT UP EACH TIME"

(R.M. DELAHAY, CHELTENHAM)

SOFTWARE SUPERMARKET

At Software Supermarket, we play all the programs we can find for the Spectrum and the BBC micro and put just the best of each type into our ads and catalogues. We do not have the biggest list of Spectrum programs - just the best: from many different program companies, large and small, famous and just-about-to-be-famous. We produce no programs ourselves, so our choice is completely impartial.

We quote reviews from all the magazines to help you decide (and to save you money) and we tell you if your joystick will work! ALL GAMES WORK WITH KEYBOARD CONTROL, TOO. We choose the best and we send them fast - which saves you time hunting round the shops. From over 40 countries you write praising our same-day despatch. Mail order or phone credit card orders only please. **You can now phone VISA or ACCESS credit card orders to us at any time, from any country where your own regulations allow it.**

48K SPECTRUM ONLY

WHEELIE One of the great games of 1984! Sensational graphics and sound: original and 100% playable. Take off on your SuperDream bike, jump buses and cars, watch out for hedgehogs as you search for the ghost rider. Will you find him? Will you beat him? Keyboard or any joystick. And the most realistic graphics and sound you've met. If only all games were as involving as this! *(Microsphere)* £5.95

THE BIRDS & THE BEES The best Bug-Byte game since Manic Miner - which is high praise. You are Boris Bee collecting nectar, but The Birds are out to get you. The birds, the plants, the centipede, the bear, the wasps - they're all after you. Of course, it plays the 'Bumble Bee' music and there are more screens than we have managed to get through. The graphics are excellent. Keyboard or Kempston/Protek/AGF joysticks. *(Bug-Byte)* £5.95

KRAKATOA ESCAPE FROM KRAKATOA is a completely amazing piece of programming. Fantastic full-screen graphics and great music. Your helicopter is huge, with a giant rotor. The explosions from the volcano are very convincing indeed. It really has the biggest graphics and the most detailed scenery we've ever seen - and it's very playable. A year ago, it would not have been possible! No joysticks. *(Abbex)* £5.95

DOOMSDAY CASTLE ZIGGY'S SECOND ARCADE/ADVENTURE. (Though if you missed 'The Pyramid' you can buy that, too! Same price) Ziggy has to explore 99 rooms of the castle to find and rescue the 6 elven stones. All in full-screen and wonderful graphics as you fight the URKS, GARTHROGS, GOOGLY BIRDS, NEUCLOIDS and ORPHACS - all with different weapons and personalities. It is quite irresistible - and don't forget to send Fantasy your coded hi-scores! Joysticks: Kempston/AGF/Fuller/Mikrogen/Protek *(Fantasy)* £5.50

BUGABOO *"One of the most interesting and enjoyable games to appear" (YrComp)* Rave reviews all round for this highly original game. As a very well animated flea all you do is try to jump up through a series of extremely beautifully drawn caverns while avoiding a pterodactyl. Realtime clock, beautiful full-screen animation and amazing colours. No joysticks. *(Quicksilva)* £6.95

VALHALLA *"100 different locations and 36 characters, all of whom have different personalities... Valhalla isn't like anything else." (PopCompWkly)* Valhalla is the only adventure where you can watch the animated characters play out the story. Join in if you wish! 6 adventures in one: print out graphics and text: it can even cope with your spelling. Spellbinding state-of-the-art adventure. No joysticks. *(Legend)* £14.95

GROUCHO *"Full of the great jokes and ideas that made Pimania such a winner." (PopCompWkly)* **Find the Hidden Star - and win a trip to Hollywood!** A mad adventure with lots of good tunes and some very good cartoon-type animation. Follow Groucho and the Piman around the USA. Discover the 22 clues - and name the hidden star - and you win the trip! (Entries close 1/6/84) A brilliant follow-up to Pimania, using every bit of the 48K. FREE 'hit single' on flipside may contain clues, too. No joysticks. *(Automata)* £10.00

ANT ATTACK *The ants are horrifyingly lifelike... hi-res graphics which are among the best I've seen" (Comp&VidGames)* The most amazing 3D animation we've seen lately, with rave reviews all round. The 3D is so involving it's being patented. 12 command keys and a game to impress your friends as you defeat the City of the Ants. No joysticks. *(Quicksilva)* £6.95

MANIC MINER *"The best-selling computer game in the country... and deservedly so... superb." (PersCompGames) "One of the best games I've seen" (PersCompToday)* Based on the USA arcade chart-topper Miner 2049er. Superb graphics and sound as you search thro 20 screens - each one a different arcade game. 20-screen demo. Kempston joysticks. The best Spectrum game in the world! *(Software Concepts)* £5.95

HALLS OF THE THINGS *The most exciting and innovative game I have seen for the Spectrum." (ZXComp)* Explore an 8-storey maze, find treasures, avoid nasties. BUT, this time, you can SEE exactly where you are and what you're doing as the maze scrolls as fast as you can move. Brilliant graphics (try waving your sword about!) and 19 command keys. No joysticks. *(Crystal)* £7.50

GO TO JAIL *"Excellent graphics are used to make a very impressive display indeed... highly recommended." (ZXComp)* The best computer version of the famous game we've ever seen. From 2 to 5 players (including the Spectrum at last! It's ruthless, but honest.) Every original feature is faithfully reproduced and the screen display is miraculous. No joysticks. *(Automata)* £6.00

16/48K SPECTRUM

THE TRAIN GAME *"An excellent game... original, well thought-out and full of action... absorbing and amusing." (S User)* Run your own railway! Change the points to avoid crashes, watch out for hijackings by irate passengers. Full-screen graphics. 30 command keys: 2 track layouts: 7 skill levels, 14 sub-levels! Demo mode and Pause while you go on strike. Very catching hobby! No joysticks. *Microsphere)* £5.95

PHEENIX *"This program has everything... superb presentation, graphics and sound. Highly recommended." (HomeCompWkly)* The full arcade-action 5 screens in the best-ever Spectrum 'Phoenix'. 5 skill levels: choice of character sets: demo mode: crams 48K quality into 16K. Kempston/AGF joysticks. *(Megadodo)* £5.50

TRANZ AM *"An original idea makes a challenging game." (PersComp News)* Take your Red Racer (full-screen graphics) all over the USA: avoid the deadly Black turbos and collect the Gold Cups. Playing area is 600 TIMES YOUR SCREEN SIZE! Realtime clock: accurate speeds: controlled acceleration: amazing Night-Driver phase. Kempston/Quickshot/Triga joysticks. *(Ultimate)* £5.50

FROGGY *"The game is superb" (ZXComp) "Unreservedly recommended... a stunning display." (ComeCompWkly)* This Frogger is leaps ahead of the rest! Loads in 2 parts: instructions and keyboard demo first: then the game - which uses so much memory you have to unplug your printer. The classic game in its very best form. Kempston/Quickshot joysticks. *(DJL)* £5.95

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48K SPECTRUM

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CLUB BENEFITS

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Members recover their membership fee many times over.
Free Club software. **Telephone Helpline.**
Machine code teach-in. **Technical advice.**

Book and software offers

THIS MONTH the Club can offer, at the usual knock-down reductions, a host of Spectrum software from Imagine.

Imagine has created some new and original games concepts, such as stopping tooth decay in **Molar Maul,** getting out of a toy box in **Ah Diddums,** and zapping through the time lanes in **Zip Zap.**

Just as Imagine has revolutionised Spectrum gaming, so CRL has brought a touch of class to the ZX-81 with its **Hi-res Graphics Toolkit.** If you want Spectrum-like graphics on your ZX-81, this package will help you achieve the aim. Last but no means least of our software offerings is **ZX Chess Two** for the ZX-81, possibly the best version of chess on the machine.

For the first time we are including books in the offer. They consist of a complete set of books for the machine code beginner and expert alike, published by Melbourne House.

As usual, the offers are open only to Club members and they will be available until the end of March. To help new members take advantage of the offers they should include orders with membership applications.

Spectrum (16K)	List price	Offer price
Zzoom	**£5.50**	**£4.50**
Zip Zap	**£5.50**	**£4.50**
Arcadia	**£5.50**	**£4.50**
Jumping Jack	**£5.50**	**£4.50**
Ah Diddums	**£5.50**	**£4.50**
Molar Maul	**£5.50**	**£4.50**
ZX-81 (16K)		
Hi-res Graphics Toolkit	**£5.95**	**£4.80**
ZX Chess II	**£9.95**	**£8.70**
Spectrum Machine Language for the Absolute Beginner	**£5.95**	**£4.95**
The Complete Spectrum ROM Disassembly	**£9.95**	**£8.70**
Supercharge Your Spectrum	**£5.95**	**£4.95**
Prism DTX 5000	**£99.95**	**£89.95**

Great Prestel add-on offer

THIS MONTH the Club offers one of the most exciting add-ons ever. Members are offered a full £10 off the Prism VTX 5000 modem, usually priced at £99.95. That will mean, in addition to the tremendous features listed, Club members will be able to correspond with each other directly via modems. A full list of Club members who have modems will be sent to other club members.

The VTX 5000 allows you to connect a Spectrum to the telephone and access the Prestel and Micronet 800 databases from your home.

Prestel data takes the form of an enormous number of linked pages. The main advantages compared to the broadcast viewdata services, like Ceefax and Oracle, are that the database is very much bigger, there is no delay involved in sending the information you require and, very important, the system allows you to talk back.

That last feature is particularly significant, as it allows you not only to look at the information but order goods and services such as TVs, cameras, insurance, travel, car hire, records, books, computers, wines and subscriptions directly if you wish.

One building society already allows you to pay bills and order statements from your home and it is to be expected that banks will follow the example.

You can load programs down the telephone line — many of them are free — look at time-tables, play games against the computer or against other subscribers and do numerous other things. Each subscriber has a Mailbox in which messages from other users can be left. Each time he connects to the system, he will be told if there are any messages for him.

Micronet 800 is what is called a closed user group within the Prestel database. It is effectively a great big computer club. There are many free programs, help and advice, reviews, all the latest information about computers, games, charts, benchtests, small advertisements and forthcoming events.

In addition, you may be interested to learn that the Sinclair User Club Helpline is now connected to Micronet. If you have any technical queries you can send a Mailbox message to the Helpline direct — the number to contact will be sent to all members.

MEMBERSHIP FORM

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Sinclair User Club

Britain

Aylesbury Computer Club: 12 Long Plough, Aston Clinton, Aylesbury, Bucks.

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon: Roundacre Microcomputer Users' Club. J Hazell, Basildon 285119/416333. Meetings every Wednesday 7.30 to 10.30pm.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Crewe and Nantwich Computer Users' Club: J E A Symondson, 46 London Road, Stapeley, Nantwich, Cheshire CW5 7JL.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX Club: Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Details from Keith Archer, 031-236 6109 (daytime).

Manchester Sinclair Users' Club: Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Nottingham ZX Spectrum Club: Would like to hear from new members. D Beattie and P Riley, 53 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Roche Computer Club: 8 Victoria Road, Coop Rooms, Roche, Cornwall: 0726 890473.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. Enquiries to R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

St Albans: Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. Telephone: 0727 54176.

Stratford-on-Avon Computer Club: Meets on the second Wednesday of every month. Telephone: 0789 68080 for details.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Austria: ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.

Belgium, France and Luxembourg: Club Micro-Europe, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (32/2/6537468).

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.
J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Irish Sinclair Users Club: PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

Italy: Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy.
Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

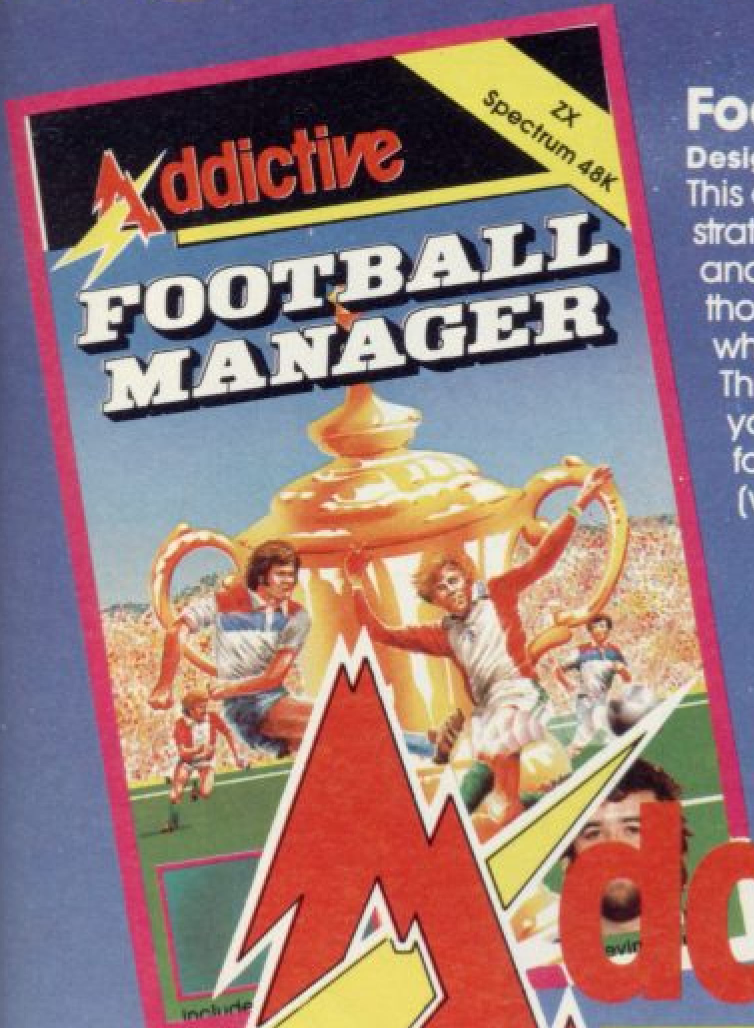
Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana.
International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede, Sweden.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

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Addictive

*ZX81 Chart, Home Computing Weekly 16.8.83

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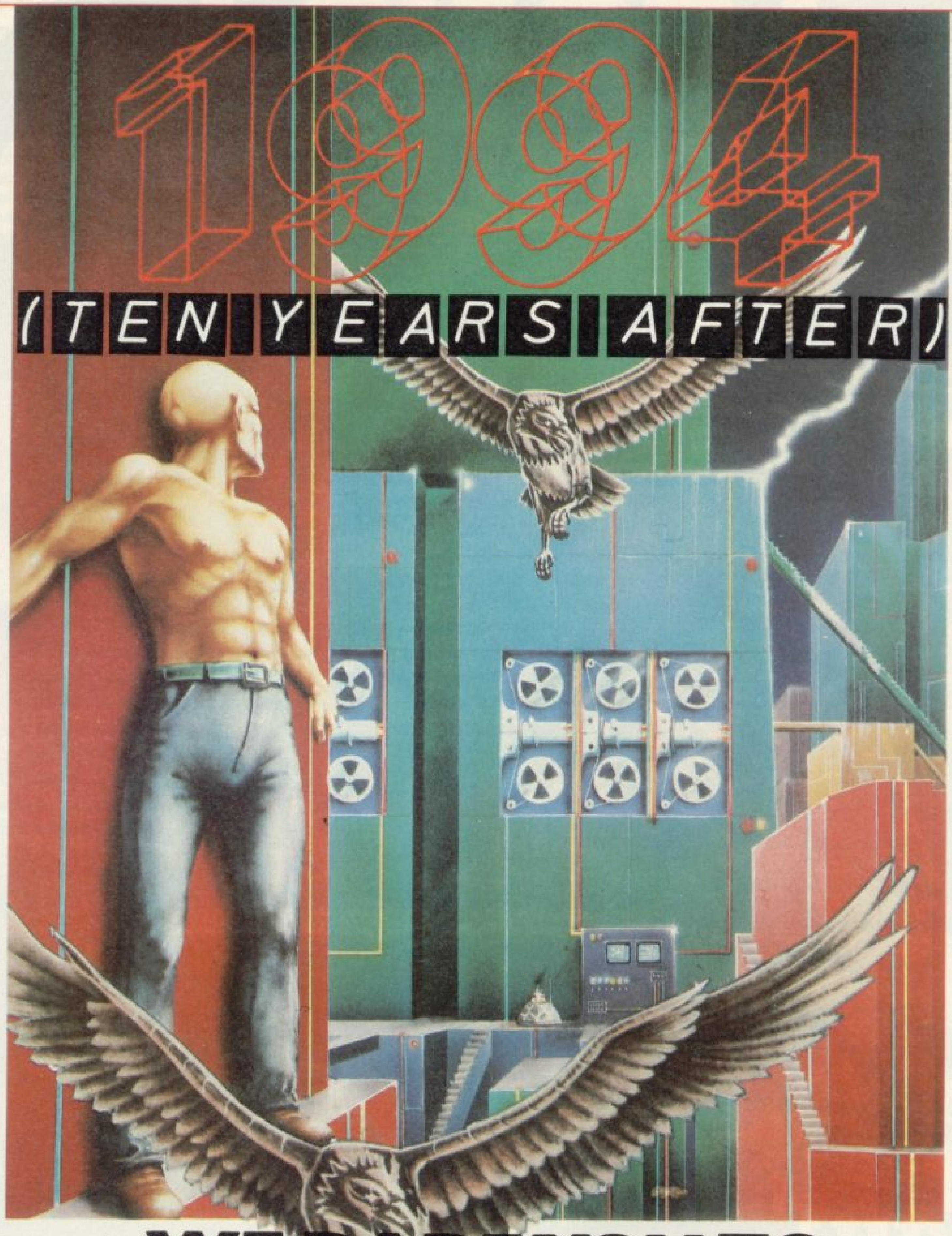
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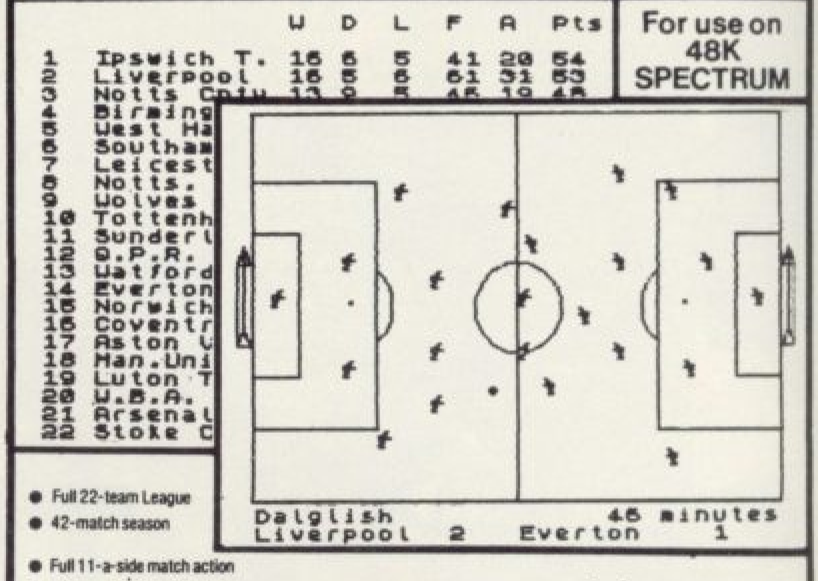
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With parent's help even tiny tots will love to play these party games. They can 'blow out' the candles on a cake, sing along with nursery rhymes, even draw on the screen. If you have a printer you can record your Clever Clogs artistic efforts and watch their progress as they develop new skills. Because each Clever Clogs program offers a choice of games to play and has the facility to increase the 'difficulty' factor your children won't grow out of them so quickly.

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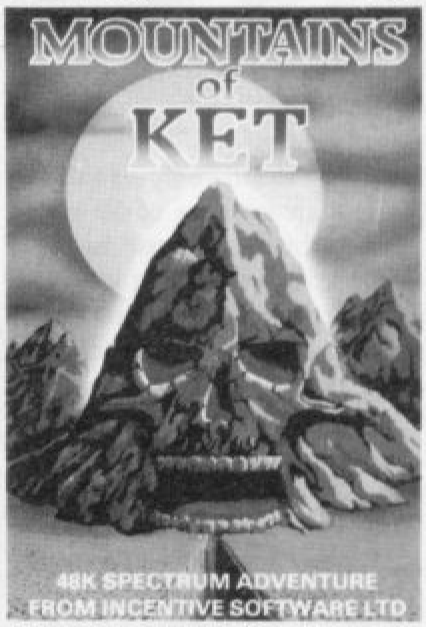
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Profits shock for Sinclair investors

CITY SHAREHOLDERS received a nasty shock at the beginning of the year when Sinclair Research announced the disappointing results for the half year to the end of October, 1983. Despite Sir Clive Sinclair's past optimism about the current financial year, the figures confirmed that the previous year's growth was unlikely to be repeated.

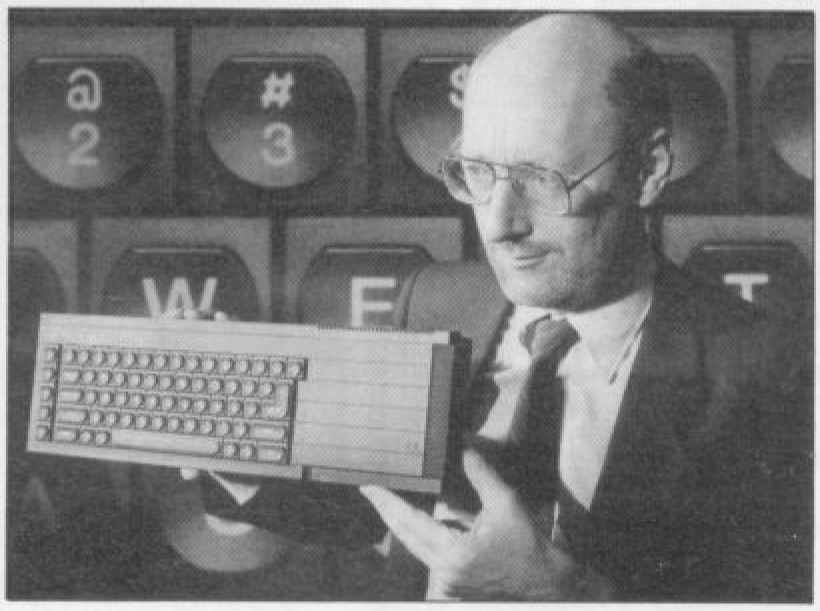
In the first half of the year Sinclair sales rose by £14 million — an increase of 60 percent — but costs rose by 85 percent. Pre-tax profit was up by only £600,000, to £4.4 million. Those figures reflect both the supply problems at Timex in Dundee, and the computer price war which caused Sinclair to drop the price of the Spectrum.

A year ago City investors were only too happy to put up £13.6 million for 10 percent of Sinclair Research, expecting profit to hit £30 million or more. It is doubtful now that by the end of March, 1984 last year's total of £14 million will be surpassed and the Sinclair Stock Market launch, expected to take place this year, could be delayed.

Micro repairs covered

PRISM Microproducts has introduced a new scheme to cover the cost of repairs to microcomputers after the manufacturer's guarantee has expired.

The 12-month contract covers the cost of all parts and labour for repairs following any mechanical or electrical breakdown. The Prism Micro Care scheme costs £14.99 per year for computers retailing at up to £250, and £24.99 for those retailing at up to £500.



Launch of the Quantum Leap

THE QL, the new Sinclair Research £399 machine for the serious user, is set to take the upper end of the computer market by storm. The 32-bit machine uses a 68008 processor and has 128K RAM as standard. It also has a typewriter-style keyboard, something the Spectrum lacked.

The customer will also receive four software packages, which include a database, word processor, graphics package and spreadsheet. All the software is on Microdrive. A startling feature of the new computer is its lack of an ordinary cassette recorder port. Sinclair did that deliberately and claims that the Microdrives are more powerful than those available for the Spectrum. They can access at least 100K and the average access time is 3.5 seconds.

As well as using an upgraded version of Basic, called Super-Basic, the QL also has an operating system, called QDOS, which contains routines to control graphics and other processes in the machine, including operation of the twin Microdrives. There are several graphics modes and the screen display can use up to 32K of available memory at any time.

Windows can be defined in the screen display and various independent tasks can be performed within the windows. That shows that the machine is multi-tasking, which means that it can be made to run several programs at the same time.

Sinclair has matched the QL against other microcomputers on the market, including the BBC Micro. At the launch Sir Clive Sinclair said that to make the Acorn machine comparable with the QL would cost approximately £1,800.

Sinclair Research is expecting big demand for the new machine but stresses that it will not take the place of the Spectrum at the lower end of the market. Managing director Nigel Searle said the machine will be aimed at business and education users, as well as the serious student.



OCEAN SOFTWARE programmer Paul Owens, left, shakes hands with 14-year-old Andrew Blackley, the winner of the Mr Wimpy championship held simultaneously in London and Manchester.

One of a ten-strong team of northern schoolchildren who played against a London team, Andrew beat his rivals by 16,000 points, achieving a high score of 81,360. Not even Owens, author of the Mr Wimpy game, has managed so many.

The two teams each played for 15 minutes on banks of Spectrums loaned for the occasion by Sinclair Research. Blackley's prize was a colour monitor for the computer room at Lostock School, Stretford, where he is a pupil, and a micro for himself. Runner-up with a score of 64,590 points was Joseph Gittings, aged 13, who won a monitor for Islington Green School, London, and a Mr Wimpy watch.

Games shops in trouble

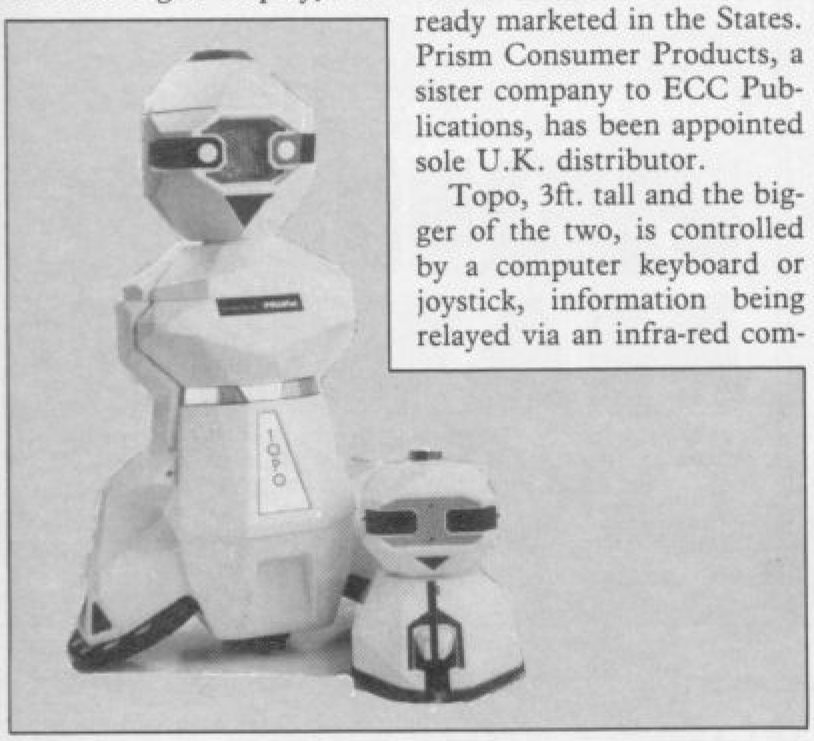
THE GAMES CENTRE, which has recently devoted an increasing part of its business to computers and computer games, has gone into liquidation. Unless a new investor can be found, the eight shops in the chain, including four in London's West End, are to be closed.

Managing director Graham Levin claims, however, that the company difficulties had nothing to do with computer and software sales.

"On the contrary, they formed the most profitable side of our business," he says. The shops were affected by cashflow problems which were aggravated in London by the pre-Christmas slump after the Harrods bombing.

Unveiling of the robots

THE WORLD'S first generation of personal robots was unveiled at London's Hippodrome by Prism Consumer Products Ltd. Surrounded by dancers and lit by a spectacular laser light display, the walking, talking machines trundled to and fro to the amusement of the audience.



The robots, called Topo and Fred, are members of the Androbot family invented by Nolan Bushnell and are already marketed in the States. Prism Consumer Products, a sister company to ECC Publications, has been appointed sole U.K. distributor.

Topo, 3ft. tall and the bigger of the two, is controlled by a computer keyboard or joystick, information being relayed via an infra-red communications link. In that way Topo can be programmed to speak, or even sing, and move round a room following a previously-memorised route.

Future applications might well include domestic chores such as vacuum cleaning and lawn-mowing and the robot could act as a security watchdog and fire detector.

The smaller robot, Fred, is capable of translating screen graphics accurately into precise line drawings.

Software written for Topo and Fred is already available for the Apple II but Prism Developments is developing packages which will allow BBC, Commodore 64 and Spectrum computer owners to use the robots.

The robots might well be, as Prism claims, the ultimate computer peripheral, and with Topo retailing at about £1,500 and Fred at £200, they are certainly among the most expensive. Sinclair users who feel those prices to be beyond their pockets might strike lucky and win a Topo robot by entering our giant competition on page 41.

Software over the air

FOLLOWING the lead of local radio stations such as Radio West in Bristol and Radio Victory at Portsmouth, the BBC has started a regular computer programme which includes transmissions of micro software.

Presented by Barry Norman, the Chip Shop consists of 25 minutes of news and general information broadcast on Saturdays at 5pm and a "takeaway service" of software transmitted four nights a week. The programs start at 12.23am following the shipping forecast.

The programs are broadcast in Basicode, a language which can be understood by a wide range of computers using a special translation tape. Listeners interested in receiving the programs have to send for the BBC Chip Shop kit, a 90-page booklet and the translation cassette, costing £3.95.

The idea for Basicode was that of the Dutch broadcasting company, NOS. It has been using the language to transmit computer programs for the last 18 months and the idea has spread to Germany, the U.S. and Australia, as well as the U.K.

Initially, the BBC transmissions were available for most popular makes of micros, including the ZX-81, but the Spectrum is making a late entry. "The Spectrum is not widely sold in the Netherlands," explains researcher David Dawson, "which is why no translation tape was available for it at first." The BBC plans to have the Spectrum service operational early this month.

The BBC has already received thousands of letters about the programme and so far no-one has complained about the lateness of the data transmissions. "We broadcast them after hours so that ordinary listeners will not be disturbed by the noise," says David Dawson. A timing device can be bought to avoid having to stay up until the small hours.

A fact sheet about the programme is available from Fact Sheet, Chip Shop, BBC, London W12 8QT.

At Wolverhampton, Beacon Radio has started another computer series. The fortnightly programme will be looking at computer applications and is experimenting with broadcasting software. The programme is on alternate Wednesdays at 9pm.

Educational advances to be exhibited

THE FIRST Sinclair Education Exhibition will be held from March 28-30 at the Central Hall, Westminster. The centrepiece will be the Sinclair stand and some 50 other supporting companies will be exhibiting, including dealers, publishers and software and peripheral suppliers. *Sinclair User* will be among the exhibitors.

The aim is to provide a central venue for all those whose products and work relates to educational aspects of Sinclair computers, giving educationalists the opportunity to acquaint themselves of the latest advances made by Sinclair and its supporting manufacturers.

Entry is by invitation only and is restricted to teachers, lecturers and others in the education field.

Ground Zero homes-in

FORMER journalist Colin Smith is selling his house in Christchurch, Dorset, to raise capital for the launch of a computer adventure game on the controversial theme of surviving a nuclear attack.

Called **Ground Zero,** the 48K Spectrum game is set in a British suburb and involves collecting the items necessary for survival.

"I thought that participating in the game would bring home to people the horrors of nuclear war more powerfully than any film or book," he says. The game is also intended to highlight what he considers the inadequancies of the Government Protect and Survive civil defence scheme.

Smith plans to move his family into premises above a shop where he will be selling Ground Zero, as well as other adventure games which he has programmed.



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DOOMSDAY CASTLE

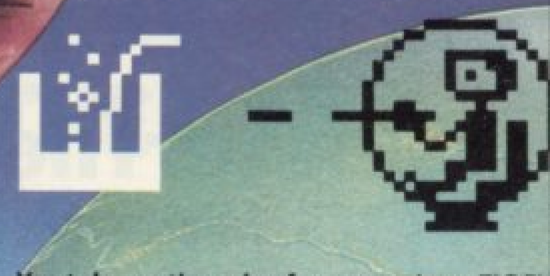
is an arcade style game with the feel of a real adventure

Doomsday Castle consists of a labyrinth of 76 complexly inter-connected Halls and Passages where you will meet a whole host of adversaries serving the infinitely evil Scarthax, the Garthrogs, the Orphacs, the phenomenally nasty Googly Bird and the Urks which manifest themselves in over fifty unbelievably weird and wonderful guises.

Scarthax has scoured the Universe to bring together the six ancient stones of lifeforce. United in Doomsday Castle they are being used to wield an irresistable power over the cosmos, emanating waves of corruption through every galaxy.

To save the Universe, you must battle your way through the Castle to find and collect the six stones and use their force against Scarthax to destroy Doomsday Castle, hopefully escaping yourself before the final cataclysmic explosion. The task is not easy (saving the Universe never is!) and it will take youmany games to unfold the structure of Doomsday Castle and discover the locations of the ancient stones. The addictive arcade style action will keep you coming back to play but the overall challenge should still keep you occupied for months.





You take on the role of our super hero ZIGGY shown here above in his exploratory capsule in combat with an Urk disguised as a pangalactic gargleblaster (!!) This is a true representation of the on-screen graphics.

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For 48K Spectrum

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Campbell Syste	Programm	secret
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Ding J	Admin	9000
Ewing J R	Chairman	90000
John	Sales	15500

EXAMPLE: ONE RECORD PER PAGE...

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Texas,
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NAME: Ewing J R
DEPT: Chairman SALARY: £90000
STOCK: DA Disassembler GRADE: X

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MH	Mint holes	.10	25000
P13	13-Amp Plugs	1.00	800
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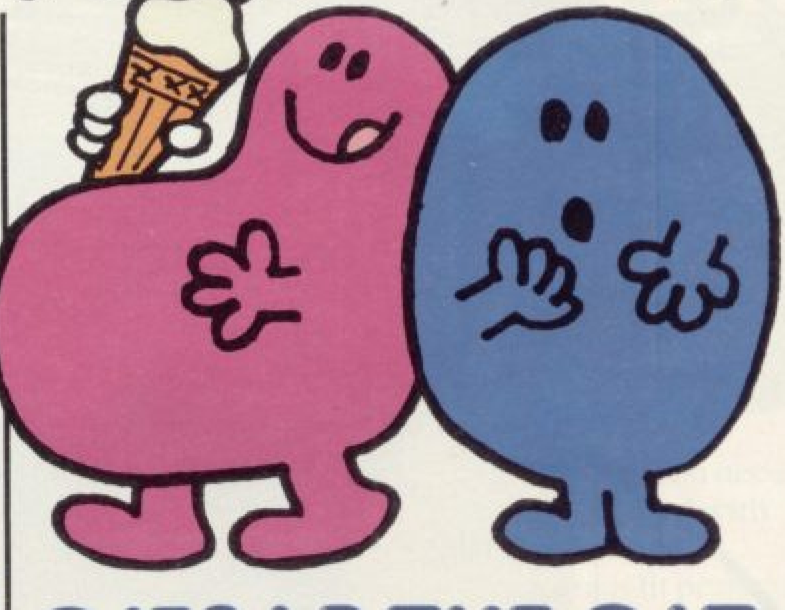
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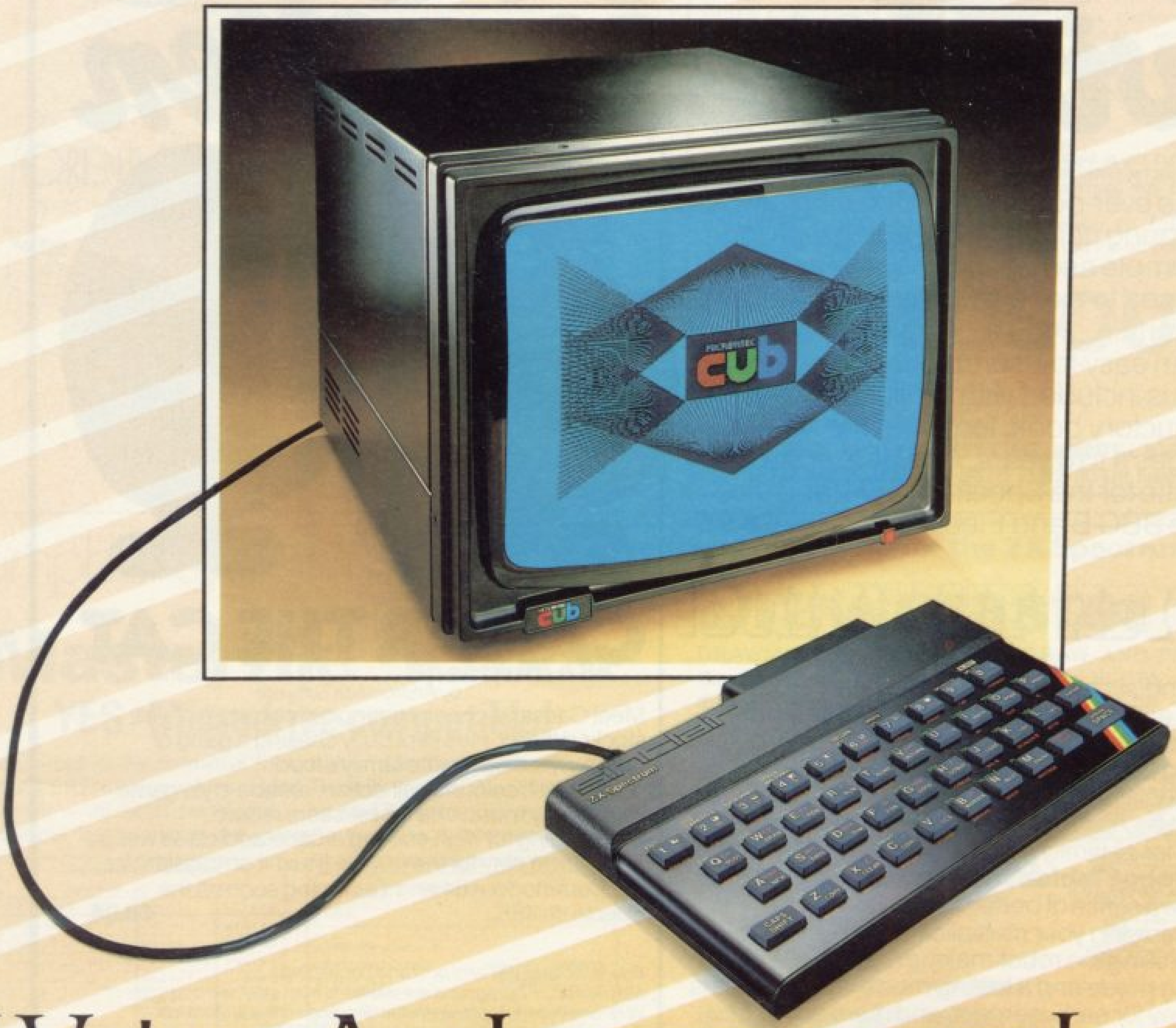
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"I HAVE SEEN THE OTHER PROGRAMS WHICH A FRIEND OF MINE HAS, BUT I LIKE YOUR PROGRAMS THE BEST. I HAVE USED IT ON THE POOLS SEVERAL TIMES, AND I HAVE BEEN VERY NEAR TO THE BIG DIVIDEND." Mr J. O., London N21.

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SU 5

Software industry not a rip-off

I HAVE to disagree with Mr Plowman of Matlock — *Sinclair User,* January, 1984 — in his assertion that the home micro software industry is a rip-off. There seem to be a few organisations to which profit is more important than building the loyalty of the customer. Most of that revolves around the cassette packaging, which is sometimes so blatantly misleading as to be inevitably disappointing when the game is ultimately played.

I do not object to there being no graphics on Velnor's Lair but should the customer not be told clearly on the packaging? If you bought a Michael Jackson record, only to find when you arrived home that it contained Michael Jackson reading the works of Proust, and if that fact was not mentioned clearly on the sleeve, might that not be unacceptable?

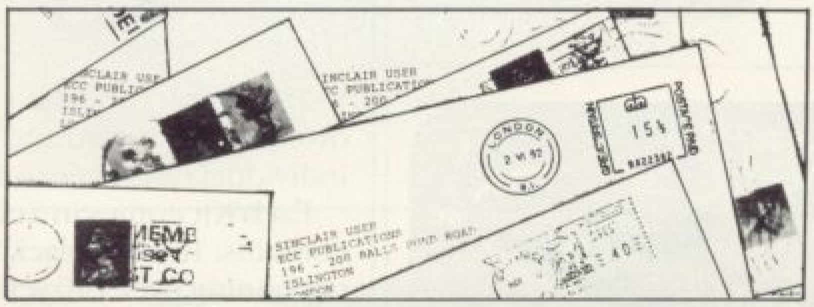
A cassette sleeve should, at the very least, show an accurate display of the game in motion and not a fanciful illustration without the remotest relevance. How many people would have bought Espionage Island had they realised there was no sound, colour or graphics?

That is not to say that we are all in for the quick buck at all costs. As a software writer's agent, we deal with many honest and honourable software houses. We may spend up to six months on a single program, revising and refining with the single motive of presenting the best value for money.

We and they together go into minute detail to ensure bug-free satisfaction and neither I nor many of my colleagues would put forward a program unless it was of a quality with which I would be pleased if I had paid for it at W H Smith.

With a little self-regulating on descriptive wrappers which I am sure will come, I will be in a long-term and rewarding business where people at home with only a Spectrum and a tape recorder can earn a fair reward from their talent for amusing or confounding programs. Fallible we are but 'gigantic rip-off' merchants we are certainly not.

John Courage,
Neil Gibson & Co,
Bury St Edmunds.



Mini-squash lines missing

MINI SQUASH, in the January issue of *Sinclair User,* ended with line 110. Further lines should have read:

```
120 GOTO 50
200 PRINT AT 0,0; "YOU HAVE LOST LIFE NUMBER ";Y
201 PRINT AT 10,9; "YOUR"
202 PRINT AT 11,9;"SCORE= ";S
203 PRINT AT 12,9; "AFTER ";Y;"GAME";"S" AND Y>1
204 PAUSE 100
205 IF Y=3 THEN GOTO 213
206 NEXT Y
213 PAUSE 150
214 CLS
215 PRINT AT 0,0; "GAME OVER"
216 PRINT AT 1,0; "ANOTHER GO, (Y/N)?"
218 IF INKEY$="Y" THEN GOTO 3
219 IF INKEY$="N" THEN STOP
220 GOTO 218
```

Program out of balance

I AM interested in making use of the program on pages 120-121 from the November issue of *Sinclair User* for keeping track of household accounts and bank balances.

My computer is a ZX-81 16K and a number of changes required seem to be obvious but I cannot understand line 370 on diagram 3.

Line 370 does not appear to be mathematically complete and I would be pleased if you could confirm that.

A W Orchard,
Richmond, Surrey.

● *Diagram 3 of John Armfield's programming article was printed incorrectly. Line 370 should have read:* 370 LET A$ = ("." + A$ AND A$ (1 TO 2) = "00") + (A$ AND A$ (1) = ".") + (A$ (2 TO) AND A$ (1 TO 2) = "0.")

Basic bug

IN THE December issue of *Sinclair User,* you published my routine for Basic program ciphering. Analysing the routine again, I found a bug in line 9999, which should read: 9999 LET n=n+5: GOTO 9993.

Marjan Klenovsek,
Celje,
Yugoslavia.

The last word on Orbiter

I DECIDED to write and settle the Orbiter record once and for all. My high score is 7,876,200. It took me nine hours.

Roger Merrifield,
Brierfield,
Lancs.

Letters poorly organised

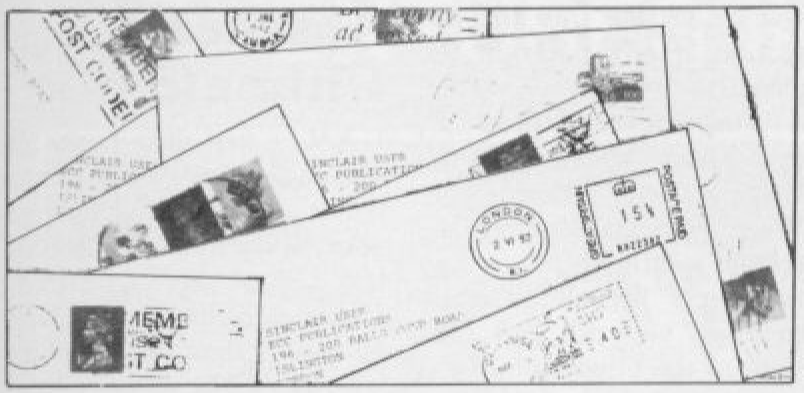
I HAVE bought almost every edition of your magazine since last November and although, on the whole, it is of very good quality, I have found your Letters page rather poorly organised. You have now published, to my knowledge, four useful tips, all informing us that by adding a third parameter to the draw statement, interesting geometrical patterns are produced. Accidentally publishing the same tip three times I might accept, but twice in one issue?

I was also amused by your reviewer's claim that the joystick facility on Interface Two was non-standard. How can any add-on from a computer manufacturer be labelled non-standard?

It was also stated that only Psion games responded to the joystick. Quicksilva, Artic and DKtronics all sell compatible software.

Your reviews, especially those on hardware, are usually highly informative and helpful to anybody choosing equipment but before publishing articles you should make sure that the subject has been properly researched.

Andrew Browne,
Ivinghoe, Beds.



In defence of Chuckie Egg

I FEEL I must write in answer to the review of Chuckie Egg, for the 48K Spectrum, which appeared in the January issue.

The object of the game, to collect eggs and corn in a hen-house using platforms, ladders and lifts, while avoiding giant birds, was correct.

I disagree with the reviewer about many other things. The fact that the birds gave more concern than the ladders, as it is difficult to negotiate the ladders, is difficult to believe. A solution to using them easily and not just as escape routes, is simply to hold the 'up' key down while running past a ladder, and the man climbs up the ladder. The two-key system works for getting off, in and out of ladders as well.

Second, the jump facility was described as difficult to operate successfully. It is almost as easy to use as the ladders. No great skill is needed and after playing the game, technique soon forms.

The playing against the clock has no great significance. Only on a few higher levels is it necessary to glance at the diminishing seconds. It was mentioned that there were three lives per level but you start with five lives at the beginning of the game and gain an extra life for each 10,000 scored.

Also at level nine the duck is released from its cage and every ninth level something new happens.

Anthony Webster, aged 15, Cheadle, Chester.

● *In addition to these comments, it has been indicated by other readers that it is easier to play Chuckie Egg with a joystick.*

Tracing the family tree

DILYS McINTYRE enquired for an advertisement of a program to produce a family tree. On page 121 of the January issue, or page 150 of the December, 1983 issue, such a program is offered by Keysoft.

John Corbett, Sinclair User Club.

● *Readers who would like to program family trees might be interested in the quarterly magazine,* Computer Genealogy, *Society of Genealogists, 37 Hallington Gardens, London SW7 4JX.*

Long-life Manic Miner

WE ARE WRITING as we believe readers will be interested in two programs which, when typed in, will either give you 32 lives or let you use a practice mode on Manic Miner.

For 32 lives, first of all type Merge "". Start tape. Stop the tape after merging the first part of the program. List. Type in line 25 poke 34269,32. Run. Start tape.

For practice mode and everlasting lives, type Merge "". Start tape. Stop tape after merging the first part of the program. List. Type in line 25 poke 35136,0. Run. Load the rest of the program. Press enter. Then type 6031769. A boot will appear by the lives at the bottom. Press all the keys shown at the same time to change stage.

Stage	Numbers to press
1	6
2	61
3	62
4	621
5	63
6	136
7	632
8	6321
9	64
10	641
11	642
12	6421
13	643
14	6431
15	6432
16	12346
17	65
18	651
19	652
20	1256

Keep up the good work, *Sinclair User.*

S C Chadwick, I Brocklebank, Halewood, Liverpool.

Counting up the bytes

MAY I add to my letter in the February *Sinclair User.* The device of including a bytes count routine at the end of a program should be treated with a RUN instruction prior to SAVEing. That clears all bytes which may have been included with the running of the program and, on SAVEing, the same number will always result. To make a check on bytes used, do not use GOTO 9980 but RUN 9980.

Charles Buzzard, Chorley Wood, Herts.

Machine code misprint

I HAVE written to report a misprint in your January, 1984 edition. 'Figure five' of the machine code sound effects should have read 33, 244,1 not 33, 2441 as it was printed because this gives the report 'B Integer out of range'. The highest number allowed in a POKE statement is 255.

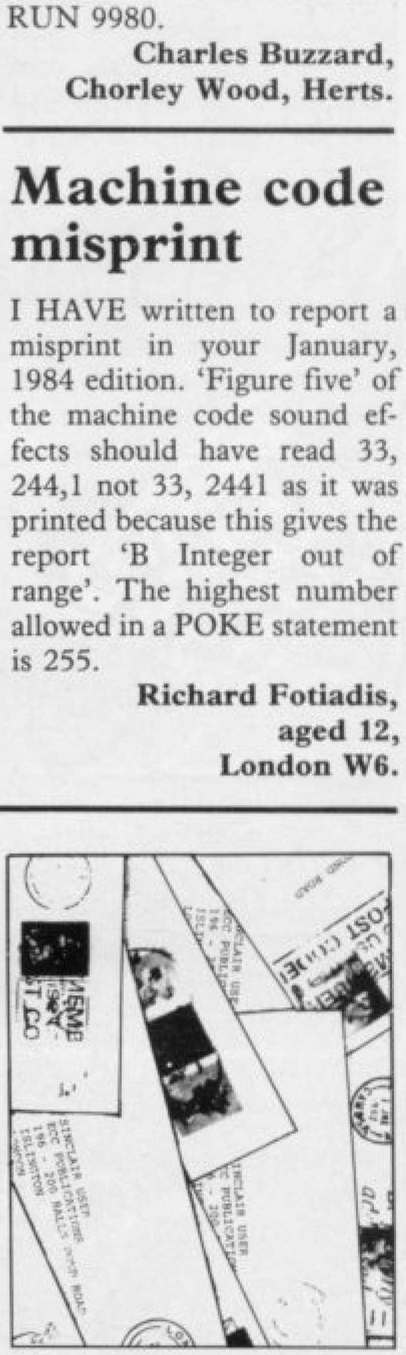
Richard Fotiadis, aged 12, London W6.

Interface changed

IN THE REVIEW of the Stonechip programmable interface for the Spectrum, published in the December issue you mentioned that the interface disabled the keyboard and that a modification would be made to all current units to overcome it. Since then we have had several telephone calls asking if the modification has been made.

The modification was made in September, and all units delivered from that date will not disable the keyboard. Those units delivered with the fault numbered fewer than 100 and most of them were returned and modified.

P J Mills, Stonechip Electronics, Aldershot.



No childish tripe

HAVING JUST bought *Sinclair User,* January issue, I turned to Letters as usual and found a letter by Mike Goodwin of Leicester. I found it bewildering, to say the least.

If he wants to find games which require him to tax his intelligence, try Football Manager, Gangsters, Plunder, Flight Simulator, Heathrow, to name a few.

I am sure many other readers could add their favourites. You have my word that none of those mentioned is in any way "childish tripe".

**P Gallagher,
Nottingham.**

IN REPLY to Mike Godwin Letters, January issue, I, too, am 35-ish and want something to tax my intelligence. That is why I write my own programs. It is the ultimate intellectual challenge — conceive the idea, write the program, then the difficult and satisfying part, get it working. Why else own a computer? If all you want to do is play games, buy a games machine.

**D B Tombs,
Faringdon,
Oxfordshire.**

Bug in Halls of the Things

I HAVE written about a bug in the supposedly bugless Spectrum game Halls of the Things, where it states that you have to get seven rings before you can get into the last section. I have found a way of getting into the last section at any point in the game.

What you do is press '2', then 'space', which opens the last section automatically. When you have entered the section a little hint is to stop and press fireball as many times as you can and then walk to the other side of the 'maze', where you will find a key. When you get the key you can finish the game by going back to the stairway which finishes the game automatically.

**Ian Sloan,
Troon, Ayrshire.**

Absence of Ultimate

I AM a first-time buyer of your magazine. While I was flicking through it I noticed your Software Listings did not include any game from Ultimate. Why is this? Is it because it does not advertise with you? The games I have are excellent.

**John Rowlands,
aged 12,
Boxmoor, Herts.**

● *Ultimate Play the Game software is included in this month's Software Directory.*

Batting for the Spectrum

I HAVE recently become the proud owner of a 48K Spectrum and my main purpose, unlike so many others who play games, is to find how a home computer can be used in cricket statistics.

As the official scorer and statistician to Hampshire County Cricket Club, and one of the leading authorities on limited-overs cricket world-wide, I would be very interested to hear from any of your readers who has similar interest in cricket statistics and who could help me to learn about computers.

I must congratulate you on an excellent magazine, which caters for a need of the now thousands of Sinclair users, and I have already recommended it to three of my friends, two who obtained 48Ks at Christmas.

**Victor Isaacs,
10 Danebury Way,
Nursling,
Southampton SO1 9YF.**



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THE CRYPT by Stephen Rentón

Prepare yourself for the many challenges that shall confront you when you dare to enter **THE CRYPT.** You will battle with giant scorpions, Hell spawn, Craners, Pos – Negs and if you are unlucky enough – the Dark Cyclops in this arcade style adventure.

Available for the 48K Spectrum at £4.95

ADVENTURES OF ST. BERNARD

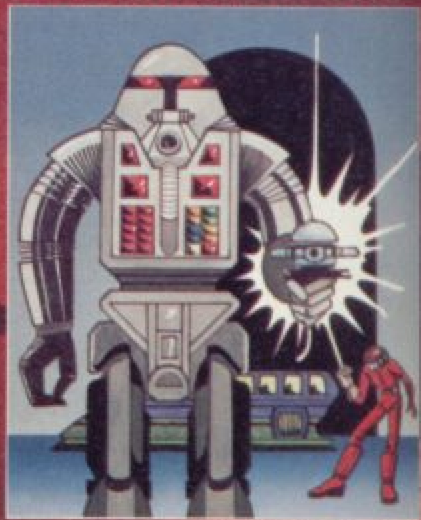


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"The whole game mechanism makes for a very Addictive Program, and one that remains a firm favourite with many Adventurers."
Popular Computing Weekly. June 1983.

For the 48K Spectrum or ZX-81 16K @ £5.00

DEVIL RIDES IN



THE DEVIL RIDES IN

I uttered the last incantations as the clock struck thirteen. All fell silent except for a faint rustling in the corner. From out of the shadows they came, all Hell's fury against me but I was not defenseless until the Angel of Death, astride a winged horse, joined the battle. Avoiding his bolts of hell fire, I took careful aim. My chances were slim, but my luck held . . .

(Fast moving, machine code, all action, Arcade game)

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The first born has been destroyed. The Black Crystal of Beroth has been banished. The alliance of Evil has been defeated by the armies of Lord Fendal. So ends the Third Age. Now we invite you to write your name in the history of the Fourth Age of the Third Continent.

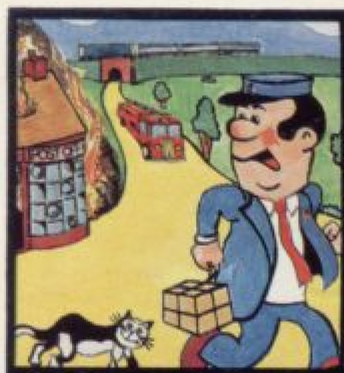
You will meet friends and enemies, old and new, in the long awaited sequel to Volcanic Dungeon. Using high resolution graphics and combining the best qualities of "Black Crystal" and "Volcanic Dungeon", we will allow you to become part of this tale of revenge.

"The Wrath of Magra" comes as three, 48K programmes on cassette, boxed with instruction manual and book detailing the history of the Third Continent and the many spells you will be using throughout the game. For the 48K Spectrum @ £12.50.

NOTE: "The Wrath of Magra" is a complete adventure. You need not buy "Volcanic Dungeon" or "Black Crystal" to play it.

Available from Feb '84

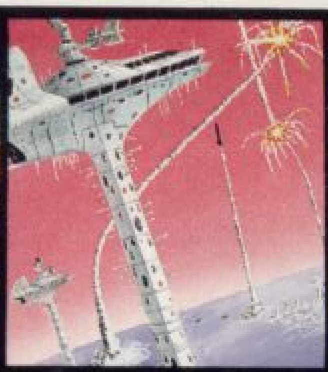
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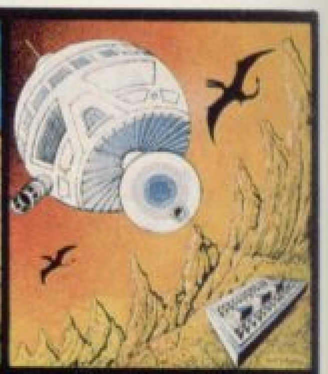
Deffendar
Earth is under attack from mutant aliens in an accurate implementation of a top arcade game – and one of the most difficult to survive in!
48K Spectrum. £6.95



Cruise Attack
Save the city from annihilation in this wonderful version of an arcade favourite. Nine skill levels, bonus points for attack ships.
48K Spectrum. £6.95



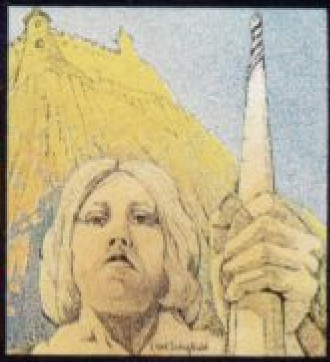
Nanas
Catch the bananas, miss the coconuts. Easy? Try it and see. Simple in concept, hilariously entertaining – it'll drive you bananas.
16K Spectrum. £5.95



Timequest
A warp-space accident spreads your capsule across time. As you land in each new era, fresh perils face you. A very skillful graphic adventure
48K Spectrum. £6.95



One Hundred & Eighty
That famous shout tells you what it's all about! A good implementation of a difficult game – doubles, trebles, twenty-five and bull all possible.
48K Spectrum. £6.95



Land of Sagan
A quest to find the long lost Staff of Health. Is it in one of the castles? Or in the Tower? There are plenty of problems – and plenty of opponents – in this great graphic adventure.
48K Spectrum. £6.95



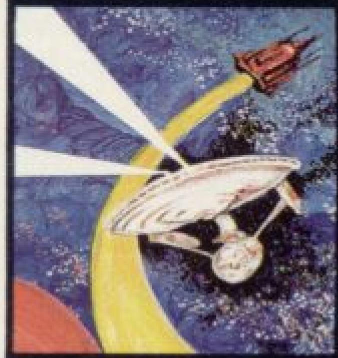
Creepy Crawler
An authentic version of one of the most addictive arcade games devised. All the usual features (Centipede, Spider, Bug, etc) with full use of Spectrum graphics and sound.
16K Spectrum. £5.95



Mad Martha II
Great sequel to the best-selling Mad Martha. Hilarious graphic adventure, with hero Henry in sunny Spain, beset by wacky waiters, mad bulls and the wrathful Martha.
48K Spectrum. £6.95



SAS Assault
Your mission – rescue the Russian ambassador from terrorist kidnappers, before the Kremlin declares war. Loads in two parts – your rating in the second depends on your skill in the first.
48K Spectrum. £6.95



Star Trek
Defend the star systems against the Klingon attack. Runs in real time – so you have to make the right decisions fast!
48K Spectrum. £6.95



Drakmaze
Find your way round Dracula's domain. A game to get your teeth into!
48K Spectrum. £6.95



Laserwarp
Invaders, Aliens, this game has the lot – and you have to survive to destroy the Master! Simple controls, far from simple task.
48K Spectrum. £6.95



Knockout
No aliens, lasers, invaders or rockets – just simple but absorbing fun which up to 4 players can enjoy.
48K Spectrum. £6.95



Galakzions
Watch out as the Galakzions break formation to attack in such force that no mere human can survive!
16K Spectrum £5.95

See them at Lightning, PCS, Tiger, Co-op, Menzies, W H Smith & other leading retailers

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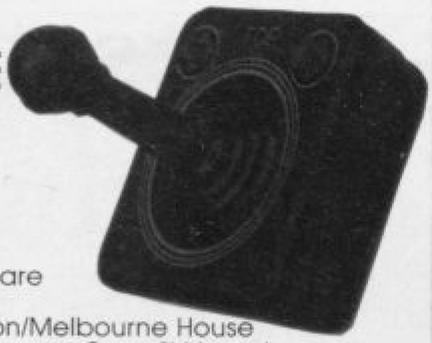
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SPECTRUM

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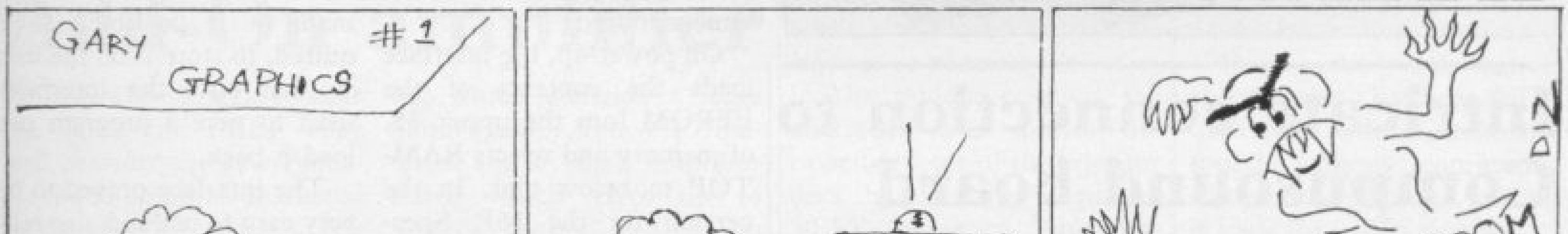
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AT LAST—LOW COST GRAPH PAPER AVAILABLE



No sooner have you started to use computer defined graphics than you discover their limitations. You have to define your own graphics before you can create the type of illustrations that are found in top-quality manufactured software.

Defining your own graphics, on the other hand, is a little complicated unless you have some kind of aid, and there are plenty of solutions available.

But what do you do when you don't have endless supplies of money to buy these gadgets?

The answer to creating high-resolution graphics best lies in graph paper. This method is cost-effective and accurate. The design has only to be drawn on to the graph paper and entered usually using the binary method. This requires a very simple program and away you go.

The result is surprisingly good and a further advantage of graph paper is that subsequent changes can be made very easily. It is essential to have a record of your illustration in 'hard copy' if, for example, you wish to colour the graphics or make them move.

Until now, even graph paper has been costly, but TRT design have just released an excellent solution. Their 'Data Design Pads' show both 'screen' and 'pixel' graphs and are priced at only £4.95 per pad—this is for 50 leaves of well laid out graph paper. Now—at last—the way is open to create lifelike graphics at a price *everyone* can afford.

TRT Design, 43b Nightingale Lne., Clapham London SW12 8SU

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Disc interface takes the waiting out of wanting

OWNERS of the Spectrum who want a fast method of data storage have, until recently, had to wait for the chance to buy the elusive Microdrive. Technology Research Ltd, however, has now taken the waiting out of wanting by announcing the latest version of its floppy disc interface.

It will accept up to two 5¼in. drives in either 40- or 80-track, single- or double-sided format and is complete with a utility disc.

The interface is in the inevitable black box which fits into the user port at the back of the computer and has a through port for other add-ons. A socket on one side takes the cable to the disc and in the back left-hand corner is a socket for the Spectrum power supply. Unusually the box lies flat and out from the computer rather than standing up; that presumably is to aid stability but if, as is the case with this reviewer, your Spectrum is housed in a full-size keyboard, you could find that the interface ends up being about 1.5cm. off the desk. An empty matchbox placed under the back edge of the interface solves the problem.

Inside the box are two PCBs; the lower one takes the signals across the board to the extension at the back and also houses the power socket and associated chips. The other contains the majority of the electronics, the disc operating chip — a 1771 — a 4K EPROM and the socket to the disc. The socket is suitably buffered so that the disc lead can be removed without crashing the system, a useful feature for BBC computer owners as it is wired to the same standard.

On power-up, the interface loads the contents of the EPROM into the upper 4K of memory and re-sets RAMTOP to below that. In the version for the 16K Spectrum the program, or more accurately the disc operating system, remains in the interface, but otherwise the two versions operate in much the same manner.

There is a complete range of commands which all have to be typed-in in full; you cannot use Sinclair keywords. The DOS gives a temporary C cursor automatically and will not recognise lower-case commands as it differentiates between the two.

SAVE will save either Basic or machine code but not variables. If the program name is preceded by a $ sign a Basic program is saved; when loaded back it will RUN from line 1. For machine code the name must be followed by three hex numbers which denote the start, finish and autostart addresses of the code.

The only time the system was made to crash was when trying to save a Basic program with the $ sign omitted; all other errors were trapped successfully by the system.

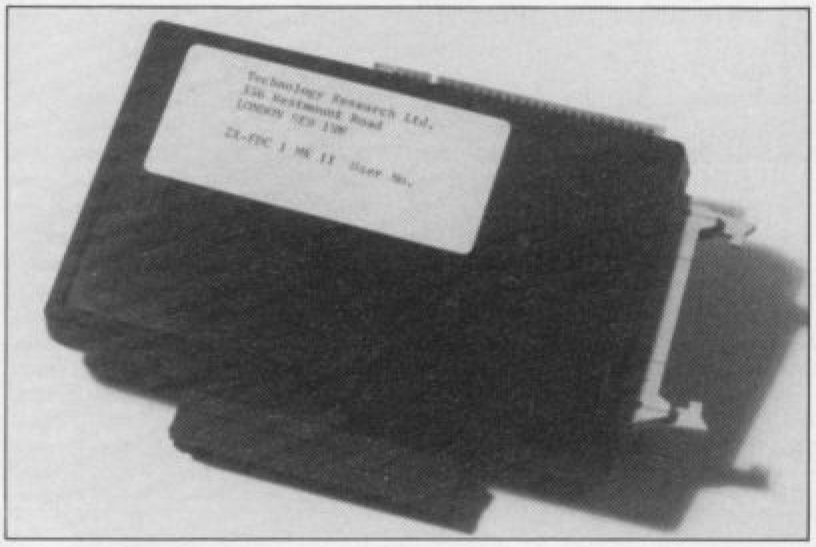
Two levels of protection exist for the user. First there is a password, which is held on the disc. After a new disc has been formatted, using the program on the utility disc, the directory must be initialised using the UNIT command. The disc will then take the name of the current password. That name cannot be changed without erasing the disc.

Second, every interface contains its own code number, and while initialising or later using the LOCK command it is possible, if required, to store it on the disc so that only the interfaces used to save a program can load it back.

The interface proved to be very easy to use and also reliable, apart from the instance mentioned. Almost any Basic program can be saved; only machine code programs which use the upper 4K of memory present a problem and they are fairly rare. Business software is being written to use the interface.

Priced at £85, the interface is rather expensive but it allows the use of disc drives which are not dedicated to one machine. Also if used with an 80-track double-sided drive it can give 390K per disc at less than £2 a time.

Further information from Technology Research Ltd, 356 Westmount Road, London SE9 1NW. Tel: 01-856 8408.



Intricate connection to Compusound board

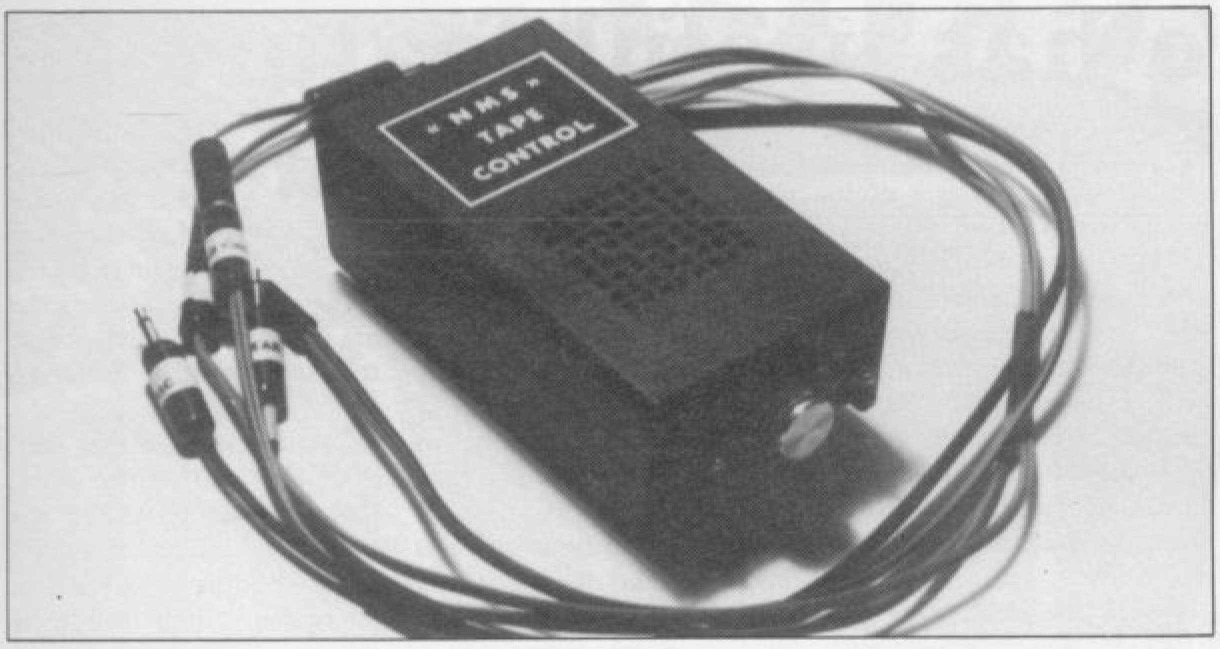
COMPUSOUND has announced a new version of its Tele-Sound sound board. As with previous models it is a small printed circuit board which fits inside the Spectrum case and outputs sound through the TV. Now, however, the unit will also work on the new Issue 3 Spectrums.

Fitting the unit is fairly straightforward, provided that you have the courage to open your Spectrum, and should present no difficulties. Three wires have to be connected to the Spectrum PCB and detailed instructions are given with the unit.

It is an intricate procedure, the connection to the speaker being particularly so. Once fitted, the unit can be stuck down and the case screwed back together. In some cases the unit may have to be tuned to get the best sound and vision on your TV and, depending on the make of your set, may degrade the picture slightly. If the picture is not particularly good to start, the degradation will probably not be noticed.

If you are looking for an inexpensive sound amplifier and are prepared to open your Spectrum, this unit, priced at £9.95 inc., is worth considering.

Compusound is at 32-33 Langley Close, Redditch, Worcs B98 OET.



Tapes under control

ONE OF the major omissions of the Spectrum design was its inability to control external devices such as a tape cassette deck. The Tape Controller from Ness Micro Systems remedies the failing and also provides an in-built BEEP amplifier.

The controller is housed in a small black box which can be placed alongside the computer and has leads to the EAR and MIC sockets of the tape deck and Spectrum. Another lead connects to the Spectrum power socket, and two more leads connect to the remote sockets on two tape decks.

If you do not want to use two separate decks for loading and saving, a connector is provided to join both leads to one deck. On the front of the controller are two switches. One controls whether the unit is to be used as a tape controller or as an amplifier. The other has three positions; up and down are used to load and save programs — without the need to remove leads as is normally the case; in the middle position the controller will control the cassette motor of the relevant deck by detecting a pre-set BEEP frequency. Also provided is a volume control and two LEDs which show how the unit is set up.

Inside the case are two tone-decoding circuits, one for LOAD and one for SAVE, which are pre-set to respond to different BEEP frequencies. Those pre-sets can be changed if more than one controller is being used. Each decoder controls a relay, toggling it on and off as required, so that only one can be on at any time.

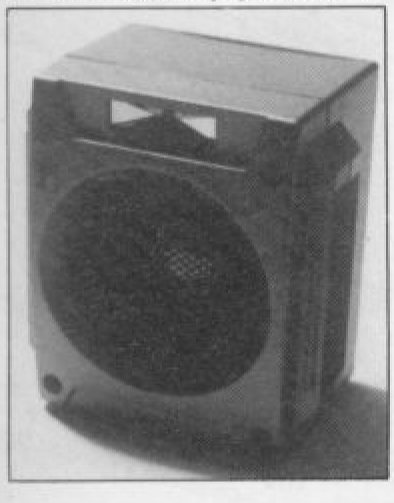
Priced at £19.95, or £16.95 in kit form, both plus £1.50 p&p, the controller represents good value.

Ness Micro Systems, 100 Drakies Avenue, Inverness IV2 3SD.

No stopping the Add-On amplifier

USERS who struggle to hear the Spectrum BEEP may well consider the new Pinnacle sound amplifier marketed by Add-On Electronics. The battery-powered unit plugs into either the EAR of MIC socket and provides enough sound to annoy the whole family.

The unit is housed in an attractive 80mm. × 55mm. × 90mm. silvery plastic casing which contains a large 8ohm speaker, four HP7 batteries and a small amplifier board which gives up to 800mW output. A LED on the front gives an indication of the battery strength.



The major disadvantage is the lack of any volume control. The only control you have is that the EAR socket gives more volume than the MIC socket. It appears to be a case of spoiling the ship for a ha'p'oth of tar. Apart from that the unit worked satisfactorily and one set of batteries lasted for more than 100 hours of continuous use. A side product is that two of the units could be used to amplify a personal stereo.

The Pinnacle is obtainable, for £9.95, from Add-On Electronics, Unit 7, Shire Hill Industrial Estate, Saffron Walden, Essex.

Generating the sound of music

FOR THOSE with a musical bent who have a Sinclair machine, help is at hand. Not a musical bent straightener but the Trichord from Petron Electronics, a stereo programmable sound generator board, available in two versions, with and without an internal amplifier and speaker, for both the ZX-81 and Spectrum. The Spectrum version can also have a BEEP amplifier built-in.

The Trichord has three basic modes of operation. First, using an inbuilt PROM, it can reproduce any of 255 sound effects ranging from one described as a 'low bong' to a steam engine and whistle, plus many indescribable ones. Second, it can be used to play three-part harmony and, finally, the internal registers of the PSG chip can be accessed to produce your own sound effects. Programs on a tape supplied with the unit demonstrate those features.

Once the information about a sound has been fed to the PSG it will maintain that sound without continuous computer updating, making it ideal for use in games.

All versions of the Trichord are in the same-sized black plastic box which has a ZX-81 connector and through port. On a Spectrum that means only a Sinclair printer could be plugged into the back of it.

With prices ranging from £24.95 for the ZX-81 version to £29.95 for the Spectrum version with BEEP amplifier, the Trichord is probably the most versatile sound generator on the market at the price. The manual is available separately at £1.25.

Petron Electronics is at Courtlands Road, Newton Abbot, Devon TQ12 2JA. Tel: 0626-62836.

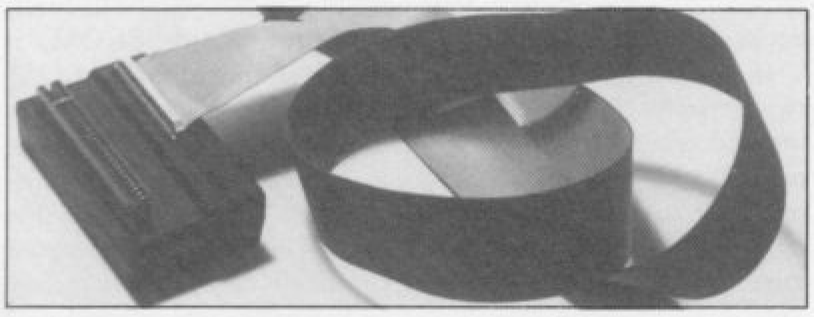
more hardware on page 36

Interface has useful features

NEW from Kempston Electronics is the Model E Centronics interface for the Spectrum. It contains an EPROM which enables it, on power-up, to direct the commands LPRINT and LLIST direct to the printer without the need for additional software. Also built into the EPROM are routines which allow the use of COPY for the Epson and Seikosha ranges of printers.

Housed in the standard Kempston case, the interface plugs into the user port of the Spectrum and is complete with a cable to connect to the printer. The interface is dead-ended in that it does not have a through port for other add-ons; that may be a problem if you want to use it at the same time as the Kempston joystick interface or any other dead-ended device. A problem which may arise with full-size keyboards is that the case is shaped with a lip to fit on top of the standard Spectrum. The lip may prevent the case fitting snugly.

Inside the case is a 2K EPROM which houses the printer software and a handful of chips which detect when the Spectrum is using the LPRINT, LLIST and COPY commands. It does that with the COPY command by monitoring an address and when the Spectrum uses it to do a COPY the interface takes over and directs output to the printer.



Using the interface is very simple. If only text is to be printed, no setting-up is needed, apart from POKEing an address with the number of columns required if that is other than the default setting of 80. That address is one of the unused ones in the system variables area.

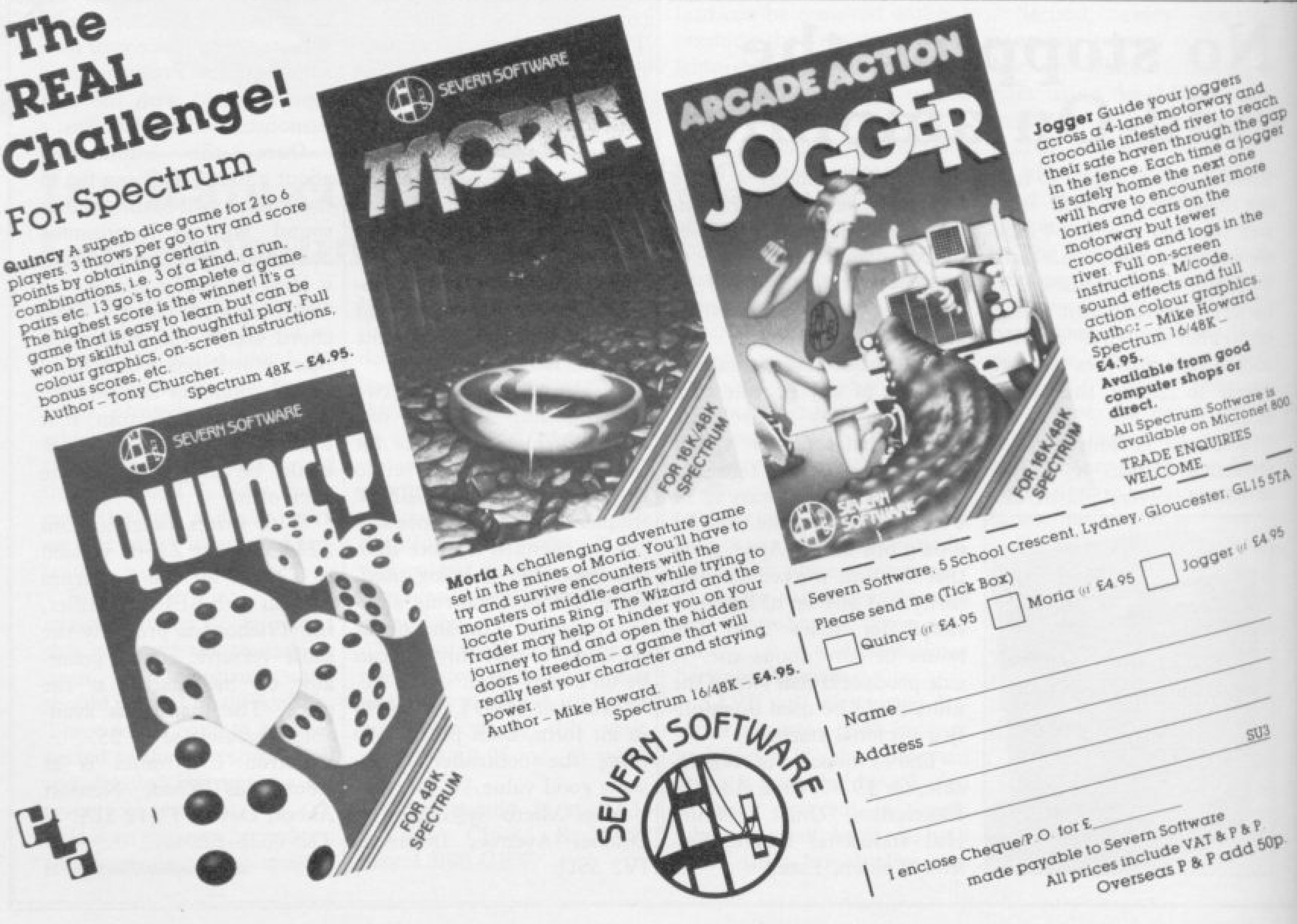
To use the COPY command the interface must be set up for your type of printer. By entering as a direct command COPY:REM? the interface displays a menu page which shows its current status. You can then set it up for the Epson range, Seikosha 100 or 250 printers, or add your own routines.

Once you have set it up in that way any user-defined characters or graphics characters which appear in a listing will be printed as shown on the screen. An annoying feature is that those characters are wider than normal characters and make the listing appear untidy.

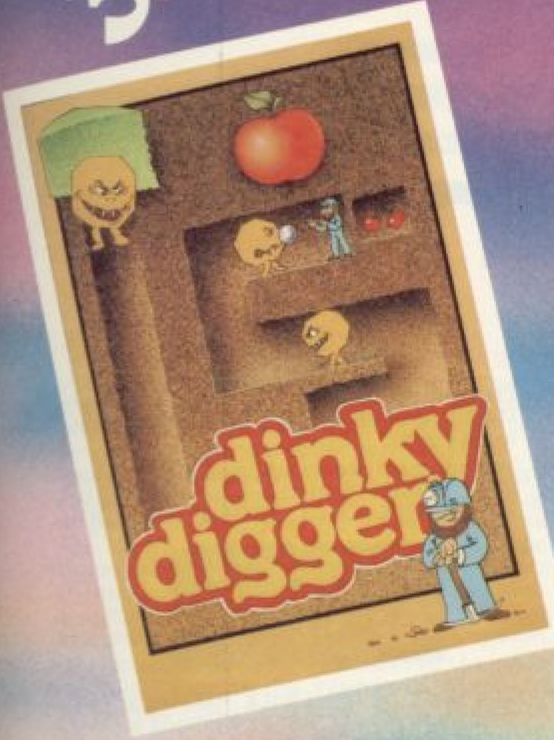
For computer artists there is an enlarged setting. When that is turned on COPY will produce a double-sized copy, about 180mm. × 145mm. on an Epson, suitable for hanging on the wall. Other settings are available to control the tokens, escape characters and automatic line feeds.

At £55 inc. the interface is by no means inexpensive — but it contains many useful features.

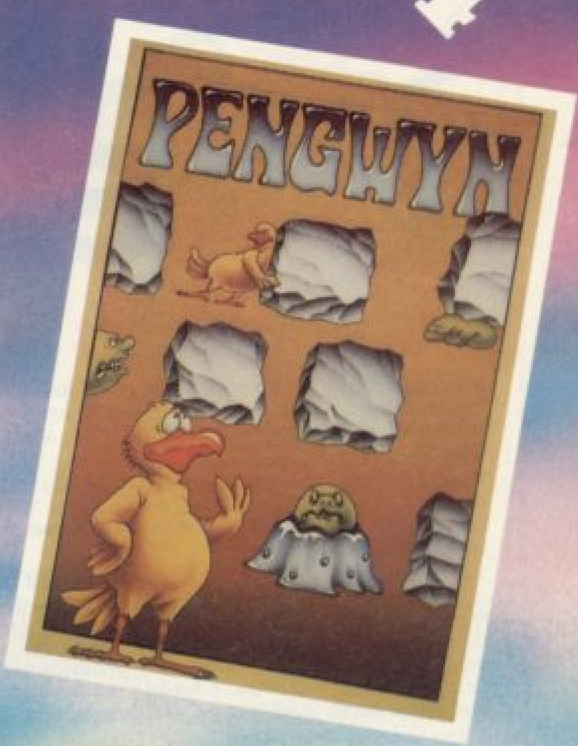
Details from Kempston Micro Electronics Ltd, Unit 30, Singer Way, Woburn Road Industrial Estate, Kempston, Bedford MK42 7AF. Tel: 0234-856633.



3 from POSTERN for '84







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Movement of the joystick is recognised by the computer *exactly* the same as pressing the appropriate control keys, and can therefore give the most immediate response to that movement. The hardware programmed design works with *all* possible key-reading methods, both BASIC and Machine Code.

Eight directional movement, with or without the fire button being pressed, can be achieved by only programming the left, right, up, down and fire keys required by the game.

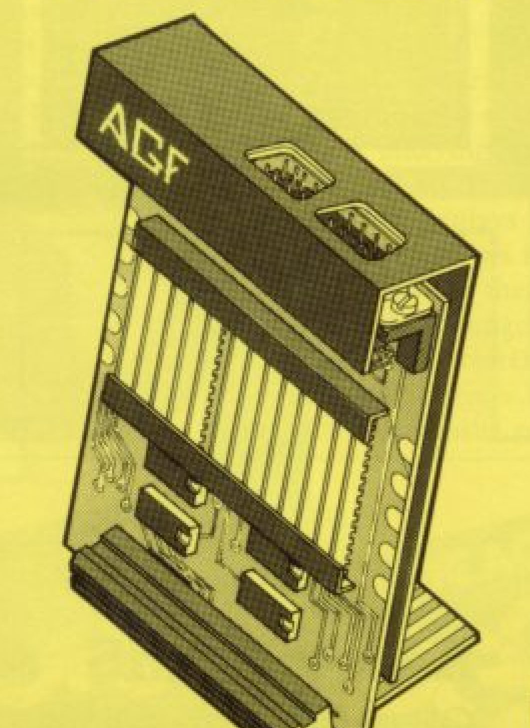
Programming is achieved by a two-digit code, which is looked up on the Programming Chart supplied, for each direction and firing button. These two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked onto a Quick Reference Programming Card for storing with the game. As the programming is *not* power dependent the interface can be immediately used when next switched on.

The keyboard remains fully functional and can be used simultaneously with the joystick.

An integral rear expansion connector means there is no need to remove the interface to connect other peripherals.

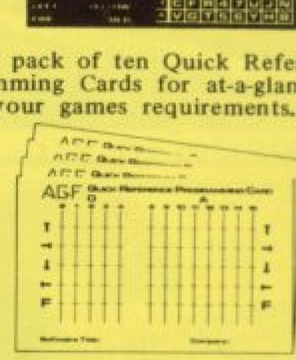
NB. A recent design improvement now means that the AGF Programmable Interface works with the new Quickshot II rapid "Auto Fire" feature.



- ★ Programmable design gives TOTAL software support.
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- Programmable Interface Module as illustrated, complete with clip-on programming leads.
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ZX81 ☐	ZX SPECTRUM ☐ Please tick	FINAL TOTAL	

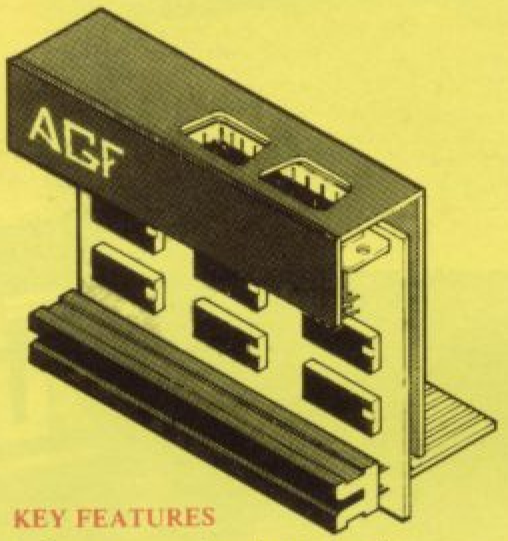
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The Interface Module II resides in the same memory space as the keyboard, which remains fully functional at all times, therefore it will not interfere with anything else connected.

When a suitable joystick is plugged into 'Player 1' socket its action will mimic pressing the cursor keys, up "7", left "5" and so on. The firing button will simulate key ϕ.

A second Joystick may be connected in the 'Player 2' position which simulates in a parallel fashion keys T-Y-U-I-P.

Using joystick control in your own programs is as easy as reading keys. Eight directions and Fire are all read by simple BASIC.

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Brainwave Microcomputers
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Buffer Micro Ltd
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Chelsea Micros Ltd
14 Jerdan Place, London SW6 1BH

Computers of Wigmore Street
87 Wigmore Street, London W1H 9FA

Everybodys Hobbies
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4Mat Computing
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QTY	ITEM	ITEM PRICE	TOTAL
	INTERFACE MODULE II	16.95	
	JOYSTICK(S)–**QUICKSHOT I**	11.95	
	SOFTWARE:		
	SOFTWARE:		
ZX81 ☐	ZX SPECTRUM ☐ Please tick	FINAL TOTAL	

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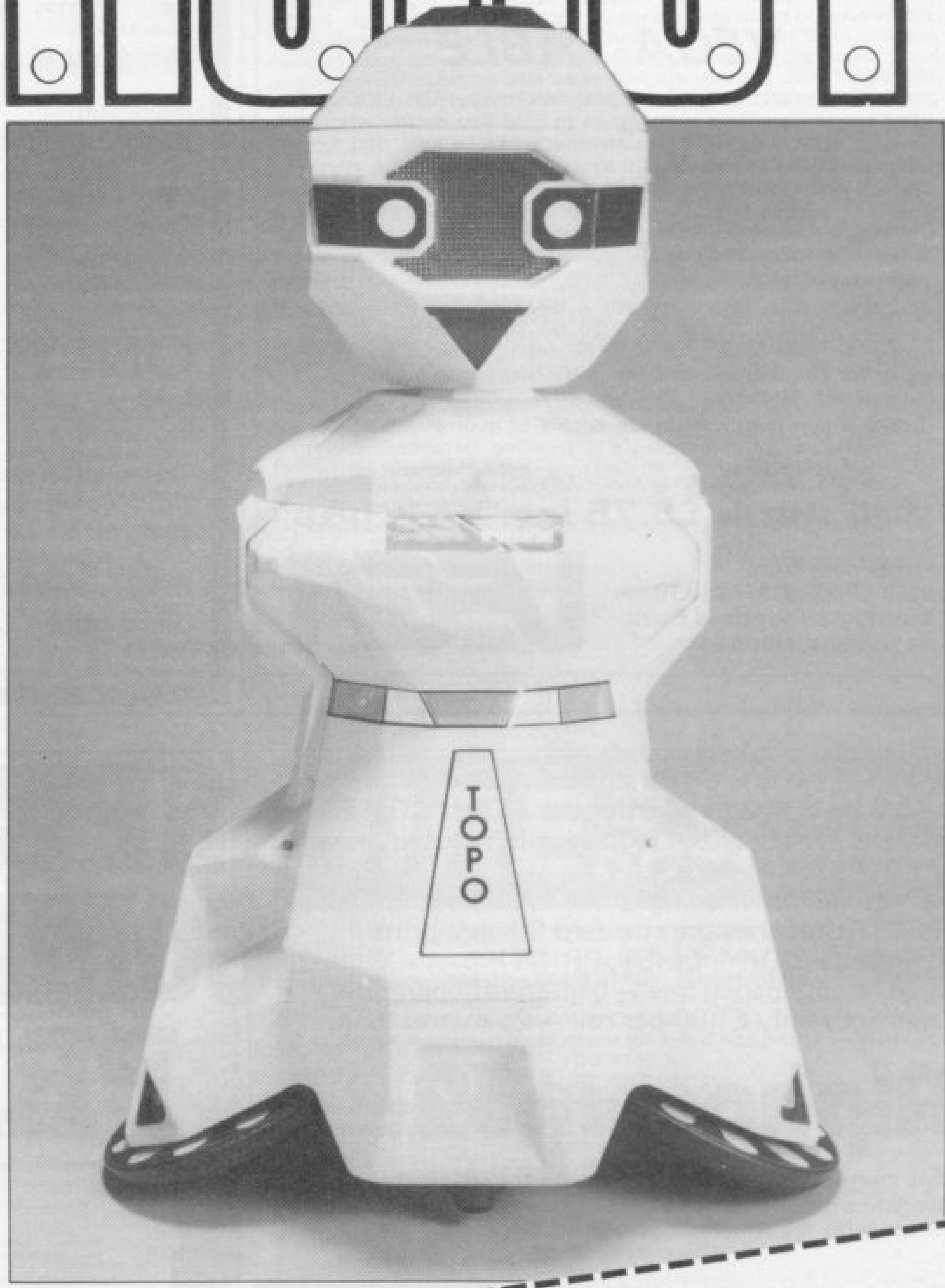
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WIN A ROBOT

Part two of our mammoth competition



THE FIRST PRIZE in our fabulous robot competition is a child-sized robot called Topo. Using an interface which can be attached to your Spectrum you will be able to make the robot do what you want. It could be used in the home, at school, or in an office to perform menial tasks.

The second prize-winner will receive two Sinclair Research Microdrives, together with an Interface One, an Interface Two, five blank Microdrive cartridges and two games cartridges, Tranz Am and Pssst.

The third prize is a Fidelity colour television set. The 25 runners-up will receive five games tapes from leading software companies — Artic Computing, Automata, Cases Computer Simulations, Crystal Computing and New Generation. All prize-winners will receive a year's free subscription to the exciting new ECC robot magazine which will be published bi-monthly from April, 1984.

How to enter

The competition is in two parts. Last month we asked you to produce a graphic representation of a robot, making imaginative use of the colour and graphics capabilities of your Spectrum.

This month you must animate the picture you have created so that the robot moves in some way. The amount of memory used in the program will be taken into account. After you have completed your animation complete the entry form on this page and, together with the coupon from last month's magazine, send it with your entry. As a tie-breaker suggest a suitable name for your robot and the reason why you chose that name.

All robot design entries must be on cassette to allow us to judge them quickly and the cassettes cannot be returned. You must enclose in your envelope the robot design, the two coupons and the entry form at the bottom of this page. Employees of ECC Publications are ineligible and the editor's decision is final.

Entry Form

Name ....

Address ....

.... **because**..............................

I have named my robot ....

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Send your entries marked Robot Competition, to *Sinclair User*, ECC Publications, 196-200 Balls Pond Road, London N1 4QA to arrive not later than April 2.



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Stored within the program are details of over 40 varieties of commonly grown vegetables e.g. planting distances, sowing and harvesting dates etc. All carefully researched and verified.

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VEGA

A NEW SPECTRUM PROGRAMMABLE JOYSTICK INTERFACE

— PLUS SOUND

(Normally a £10 Add on)

from **Rainbow Electronics**

PROGRAMMABLE — Allows any joystick position to represent any key — *without* wires, or leads, or tapes!

UNIVERSAL — Enables use of *ALL* Software

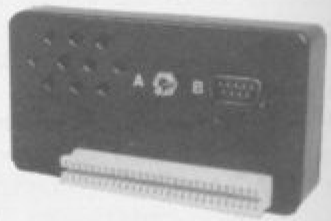
AMPLIFIED SOUND — Internal micro-chip amplifier boosts Spectrum's beep with simple connection to ear or mic socket.

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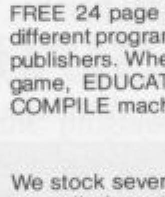
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SU 3

Space games to keep you firing

RECENT RELEASES from Romik Software all seem to follow roughly the same well-tried shoot-them-before-they-shoot you formula.

Galaxy Jailbreak for the 16K ZX-81 features a prison somewhere in space. You have captured some evil alien generals whose soldiers are trying to free them by nibbling away the walls of the jail. You control a stellar base which fires five missiles at a time and can attempt to shoot the soldiers before they get the generals out; if they get out, the generals start dropping bombs on you, making your life much more difficult.

Another mysterious law of outer space also decrees that if you shoot a general, he turns into five soldiers. You score 50 points for hitting a general, 20 for hitting a soldier.

Although the concept is not brilliantly original, Galaxy Jailbreak is enlivened by some fast action, and easy-to-use control keys — half the bottom row moves you left, the other half moves you right — are an additional bonus. Make sure you read the opening instruction screens carefully, as the game does not give you a second chance to see them without re-loading.

Galactic Trooper, also for the 16K ZX-81, is in a similar vein. Again, you must be careful to read the instructions, as the graphics are a little confusing and they will not be explained again once the game has started.

The idea is to amass as high a score as possible by destroying a galactic attacking force and prevent it landing on earth. If a landing craft touches down, you lose your firing base.

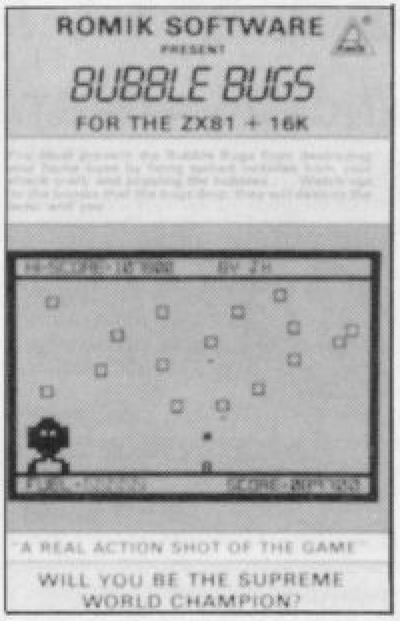
The screen display shows the enemy mothership, worth 500 points, ranging back and forth above the ranks of drones; drones give you 20 points if you shoot them before they drop, 40 points if you catch them in mid-air. A mystery score is attached to the saucers, otherwise known as landing craft. You receive an extra ship if you reach a score of 10,000 points.

Unless you are an experienced player, you may not find that easy. Although it is easy to increase your score quickly at the start — just keep firing — stopping the saucers landing and putting an end to your activities is a good deal more difficult. Again, not a strikingly original game, but one which should appeal to addicts of the fire button.

Other games for the 16K ZX-81 from Romik Software include **Bubble Bugs,** which entails firing spiked missiles at enemy bubble bugs to burst them before they destroy you with their bombs. **Bank Robber,** for a change, does not take place in space — or does it? — but involves removing as many money bags as possible from the bank and getting them home, while avoiding the meteorites, bricks and pills some unexplained force is hurling at you.

The game also features open and closed doors to negotiate, and you can choose the number of meteorites and speed with which you would like to be confronted.

All the games are available from Romik Software, 272 Argyll Avenue, Slough, Berkshire .





GALAXY JAILBREAK
GALACTIC TROOPER
BUBBLE BUGS
BANK ROBBER
Memory: **16K**
Price: **£4.99**
Gilbert Factor: **6**

Hazardous quest for Sinclive diamond

JUST BEFORE its long-awaited premiere, the Sinclive diamond was stolen from the jewel room of Microdrivia. It is the player's task to find and replace the diamond as soon as possible and then to bring back the fake diamond to the Secret Police headquarters.

The game follows a conventional adventure format, with descriptions rather than pictures of locations. Hazards abound. You are likely to be found and killed by the police, run over on a busy road, shot down by a man with a gun, or die of starvation, all before the first series of locations has been left. The threat of dying of starvation effectively puts a time limit on the game. The player has a maximum of 29 turns in which to deal with the problem before dying.

Playing the game raises some questions. Why is the key where it is? Why are the police trying to kill the player? Who is the strange man with the gun who shoots you whenever you attempt to buy a train ticket? Some players may find the questions simple to answer — or there may be no answers.

The level of difficulty is well-thought-out. There are sufficient accessible locations, clues and red herrings to keep the player involved in the game for a long time, before finding the diamond even becomes a possibility remote on the horizon.

Diamond Trail is produced by Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan CF6 8LE.

DIAMOND TRAIL
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **7**



Collecting mail is just a start

DODGE CITY is made up of two games, an arcade and an adventure which are supplied on different cassettes. The player's aim in the arcade game is to elude pursuers, dodge cacti and collect the mail. Six successful mail collections completes a skill level and 12 skill levels must be completed before the adventure game can be played.

At the end of alternate skill levels the player arrives to find that a telegram containing a clue for the adventure has been delivered. They appear and disappear slightly too quickly to be noted at the time but the game is so difficult that frequent re-starts will mean that most players will have memorised the clues by the time they reach level 12.

Various groupings of Indians, Mexicans and Confederate soldiers appear chasing the player during the game. Moving to the correct part of the screen at the proper time means that they can be shaken off quickly, although finding the proper place and the correct time can take hours.

An infuriating feature is that the mail collector can be shot at any time, even when no bullets have been seen to fly, or the pursuer behind is dead, or even when there is no visible pursuer behind. Another problem for the player is that Confederate soldiers seem to have nine lives, possibly because there are two of them on each horse.

Once the twelfth level has been reached and the player arrives in **Dodge City** the adventure begins. The sheriff's deputy is dead and what better suspect could the sheriff have than the mail rider who just arrived in town?

Dodge City is produced by Phoenix Software Ltd, Spangles House, 116 Marsh Road, Pinner, Middlesex.

DODGE CITY
Memory: **48K**
Price: **£9.99**
Gilbert Factor: **7**

Enter the Chinese oracle

THE I CHING, or Book of Changes, is an ancient collection of oracles refined and expanded by Chinese sages over 5,000 years. Reflecting a cosmology founded on the simple opposition of light and darkness, of Yang and Yin, the oracle is usually consulted by dividing heaps of yarrow stalks or tossing coins, and those generate patterns of broken and unbroken lines known as hexagrams.

In the Salamander Software version of **I Ching,** for the 48K Spectrum, the coin-tossing is simulated on the computer, the hexagrams displayed, followed by the interpretation of the questioner's present and future situation.

As with all fortune-telling, much depends on how you interpret the answers but the I Ching is frequently disturbing in its analysis. When asked: "In the event of a nuclear confrontation will mankind survive?" the oracle replied: "Change, sudden surprise or shock. Worrying at first, but on a second look there is no problem and even a chance to learn from the situation."

The program appears to be faithful to the original, though it is annoying that the hexagrams are given only Chinese names and are not numbered. There are also some inexcusable spelling errors.

Those familiar with the I Ching might be more aware of the program's shortcomings but for others it is an enjoyable, intriguing introduction to an ancient philosophy.

Finally, it seemed appropriate to consult the oracle as to its own worth. Asked "Is this tape of benefit to Sinclair users?" the resulting hexagram was unchanging: "Understand the steps required between what you have and what you want. Work hard but allow time for rest and pleasure."

You can make of that what you will.

I CHING
Memory: **48K**
Price: **£7.95**
Gilbert Factor: **7**

Composer's difficult instructions out of tune

COMPOSER is another of those programs which allow their users, with a little practice, to play, compose, edit and save BEEPing sounds which bear some resemblance to tunes on the 48K Spectrum.

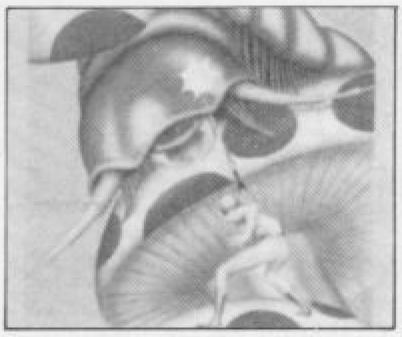
Using the BEEP instruction on the Spectrum is not a difficult matter. The manual explains it clearly in four pages and expects the user to be able to program the computer to play Mahler's first symphony at the end of that time. The instructions for **Composer** are longer than that chapter and add nothing to the user's programming knowledge.

Composer is a fairly difficult program to master, for the unexciting screen layout contains many abbreviations which are confusing even to those experienced in musical theory. Further, the instructions on the cassette insert, which are supposed to form a kind of crib sheet, contain a misprint which makes the matter even more difficult.

Before buying the program it is worth reading chapter 19 of the manual. If that is comprehensible, Composer is unnecessary; if it is incomprehensible, there is every likelihood that the Composer instructions will be as well. Check, too, if you have no experience of composition that you have a supply of sheet music to hand before attempting to program a piece of music, or the results will not prove worthwhile.

Composer is produced by Contrast Software, Farnham Road, West Liss, Hampshire GU33 6JU.

COMPOSER
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **2**



Mutant garden is compulsive

GARDENING can be a lethal business in the post-holocaust world of **Millypede,** from Add-On Electronics. In this version of the standard arcade game, plant and animal life has mutated after an inter-galactic fusion bomb has devasted the Earth. To prevent mutant bugs and creepy-crawlies getting into your family anti-fusion shelter you must zap and zap again as the mushroom patch is invaded by inexorable splitting millypedes.

Sickly bouncing spiders trampoline across your field of fire and you have to stay well clear of their trajectories if you want to survive to do the weeding another day.

You move and fire your laser with the QWERTY keys and you can shift the base up into the lower part of the screen to avoid any ravening bugs which have reached the bottom line. The machine code graphics are colourful and the millypedes snake and ladder down the mushrooms at an alarming rate. Your score is reckoned by the number of mushrooms, millypede segments and spiders you eliminate and there is a high score initialling facility.

Millypede is a reasonably fast and compulsive variant of an arcade oldie and will have you returning for just one more try, but watch for that darned spider. The game, runs on any Spectrum.

MILLYPEDE
Memory: **16 or 48K**
Price: **£5.00**
Gilbert Factor: **7**

Magic and mayhem at start of trilogy

THE LORDS of Ket rule a strife-torn land where magic and mayhem are normal. Raiders from the east sweep in and devastate the countryside, spurred by the villainous priest-king Vran Verusbel, arch-mage of the cult of Mad Monks, and by the beautiful though utterly evil priestess Delphia.

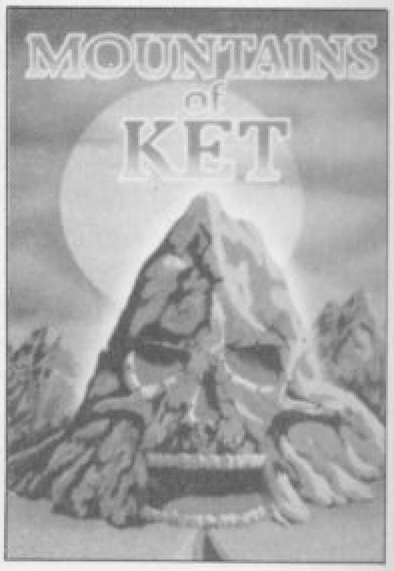
You know little of that as you languish on Death Row awaiting execution for a crime you did not commit. Suddenly, on the eve of your demise you are summoned before the Lords who give you a stark choice — die tomorrow or travel east through the perilous **Mountains of Ket.** Your mission is to destroy Vran and Delphia and thus end the troublesome raiding. Of course you accept but, in case you were thinking of running away, the Lords have placed a magic assassin bug call Edgar on your neck to ensure loyalty to the cause.

That is the setting for Mountains of Ket by Incentive Software, billed as the first in a trilogy of interlinking but independent adventures. Mountains of Ket is a text-only game which features combat, creature interaction and a monetary system. Your prowess, energy and luck determine your likelihood of surviving in combat and it is wisest to steer clear of fights wherever possible. You do not begin as a very expert swordsman and you will get further by cunning and commonsense than by chopping away at every creature you bump into, and once you get into the mysterious mountain there are many unpleasant characters roaming the caverns.

As in The Hobbit, your score is calculated on a percentage basis and there is a save-game facility. The creature interaction is somewhat limited, however, and talking to the characters can be difficult. Edgar will not give you much help if you are being lazy but has useful suggestions at crucial points.

You would be wise to keep a map as you progress; the path is long and there are many perils as well as rewards in the form of treasure, false beards, magic wands and the like. Mountains of Ket is a stimulating adventure which will keep you busy for some time.

MOUNTAINS OF KET
Memory: **48K**
Price: **£5.50**
Gilbert Factor: **8**



Piman wanders from the straight and narrow

HOW ARE the mighty fallen! The self-righteous Piman has returned from Hollywood where he clearly picked up some terrible habits from chain-smoking Groucho and has now become a skid row problem drinker The new Automata release, **Pi-Eyed,** for 48K Spectrum, is an arcade-style descent into the unsavoury depths of Pi-Land pubs.

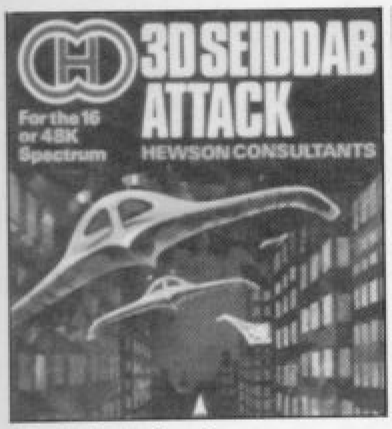
Using the cursor keys or a Kempston joystick, you must steer the tipsy Pi-Man along the road, avoiding irate motorists, and get him into various noisy and messy hostelries like The Merry Corpse or The Gay Dog. You may also enter some of the other buildings on the Pi-Land main street, where you will receive encouraging or abusive messages.

Once inside a pub the Pi-Man must drink all the pints of beer on the bar before he can weave his unsteady way out to find another watering hole. You do not increase your score in this game — you start with a high score which is reduced progressively the more you drink. Points are also deducted if you annoy motorists, tread on packets of Rhino crisps or even more unpleasant substances, or disturb other pub patrons.

When the Pi-Man finally reaches rock bottom zero, his beer intake for the game is displayed; if the hangover is not too bad you can then totter back and start all over again. It is always opening time in Pi-Land.

Pi-Eyed continues the Automata tradition of bizarre, inventive games design and combines the usual garish graphics with a loopy setting and maddening music. The loading logo of two awful bloodshot eyes is disturbing. The game is reasonably entertaining though the format is a repetitive after a time.

PI-EYED
Memory: **48K**
Price: **£6.00**
Joystick: **Kempston**
Gilbert Factor: **6**



Seiddab hunt confusing

3-D SEIDDAB ATTACK from Hewson Consultants puts you in command of a space-age tank, or "drone", in which you must patrol the city streets, shooting down any Seiddabs — whatever they are — within range.

The screen display offers a 3-D representation of the streets and the view through the drone's windscreen. You can move your sights up and down to frame the enemy and the left and right keys move your vehicle in relation to the outside scene.

If you clear the first screen, by shooting down at least 10 Seiddabs followed by the enemy task force leader, you are transported to the open countryside, where you must face the fresh hazard of enemy bombs.

In spite of a sophisticated concept and some very satisfying explosive effects whenever you make a direct hit, the screen display of **3-D Seiddab Attack** is not as clear as it might be, with flickering graphics adding to the confusion.

Improving your skill at scoring in the game is reasonably addictive and it offers the well-tried pleasures of shooting things out of the sky to addicts of that pastime.

3-D Seiddab Attack is produced by Hewson Consultants, 60A St Mary's Street, Wallingford, Oxon OX10 0EL.

3-D SEIDDAB ATTACK
Memory: **16K**
Price: **£5.95**
Joystick: **Kempston**
Gilbert Factor: **5**

St Bernard's mission dogged by disaster

ADVENTURES of St Bernard for the 48K Spectrum was produced by a husband-and-wife team and the graphics by former fashion designer Linda Ferguson are very attractive.

The story features Brandy the St Bernard dog, who is trying to rescue his mistress from the clutches of the Abominable Snowman. In the first stage of his mission, Brandy is besieged by a pack of wolves. If he manages to kill them all, by turning to face each one, he goes on to stage two which involves jumping over icy pools, in many cases inhabited by a walrus which makes a successful leap more difficult.

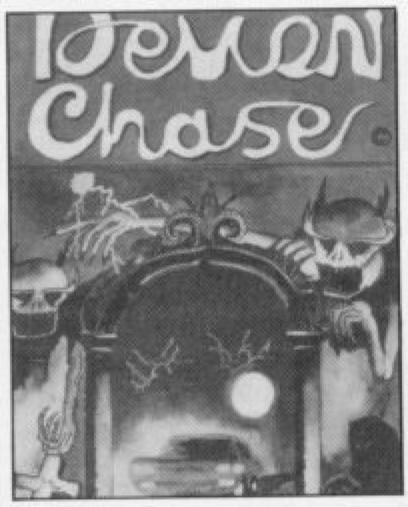
Stage three features tumbling snowballs and more wolves. Then there is the Snowman and finally more pools and a horde of skating penguins.

The game is an addictive one and should appeal to anyone with plenty of persistence and a good sense of timing. It also makes a pleasant change from the more violent scenarios of most Spectrum games.

The Adventures of St Bernard is produced by Carnell Software.

THE ADVENTURES OF ST BERNARD
Memory: **48K**
Price: **£5.95**
Joystick: **Protek, AGF II**
Gilbert Factor: **7**

Ever-growing caterpillar



THE PLAYER'S aim in **Demon Chase** is to move round the screen, avoiding the tombstones and walls, catching the demons and hitting the diamond-shaped bonus-point scores. Inexplicably the player's on-screen persona is what appears to be an ever-growing caterpillar, which creates the further obstacle that players must avoid their own tails.

The first level bears a distinct resemblance to a variety of amateur games, most of which are based on the adventures of a worm or caterpillar. On subsequent levels the amount of obstacles is greater, as is the amount of devils to be captured.

Demon Chase LOADs with a title page containing as many symbols of evil as could possibly be crowded on to a television screen. The graphics in the game are, by comparison, unimpressive, consisting for the most part of individual user-defined graphics-type figures.

The game is unoriginal and does not inspire the player to continue to higher, more sophisticated levels. It would appeal most to players who like games which depend on fast reactions. Such players, however, might be able to find more exciting variations on this theme elsewhere on the software market.

Demon Chase is distributed by Mansfield Computers and Electronics, 33 Albert Street, Mansfield, Notts. NG18 1EA.

DEMON CHASE
Memory: **48K**
Price: **£5.50**
Gilbert Factor: **4**

Speed makes up for unoriginality

IN MUNNERY'S Mergatroids, for the 48K Spectrum, you must pilot your ship, The Spirit of Watford, across the desolate valley of the Mergatroids, blasting the aliens which swarm up to meet you from the distant mountain range.

Graphically the game resembles the arcade Battle Zone, with both aliens and scenery outlined against the dark backdrop. The simplicity of the graphics is more than compensated for by the 3D effect and the speed of the game, and quick responses are needed as you swerve to left and right while hammering away at the enemy.

Lacking originality, the program is nevertheless instantly addictive. It is accompanied with a B side bonus, a trivial game called **Night Driver** in which the graphics are minimal and the action monotonous. The two-game cassette—and to describe Night Driver as a game is to use the term loosely—is produced by Abacus Programs.

MUNNERY'S MERGATROIDS
Memory: **48K**
Price: **£5.95**
Gilbert Factor: **6**

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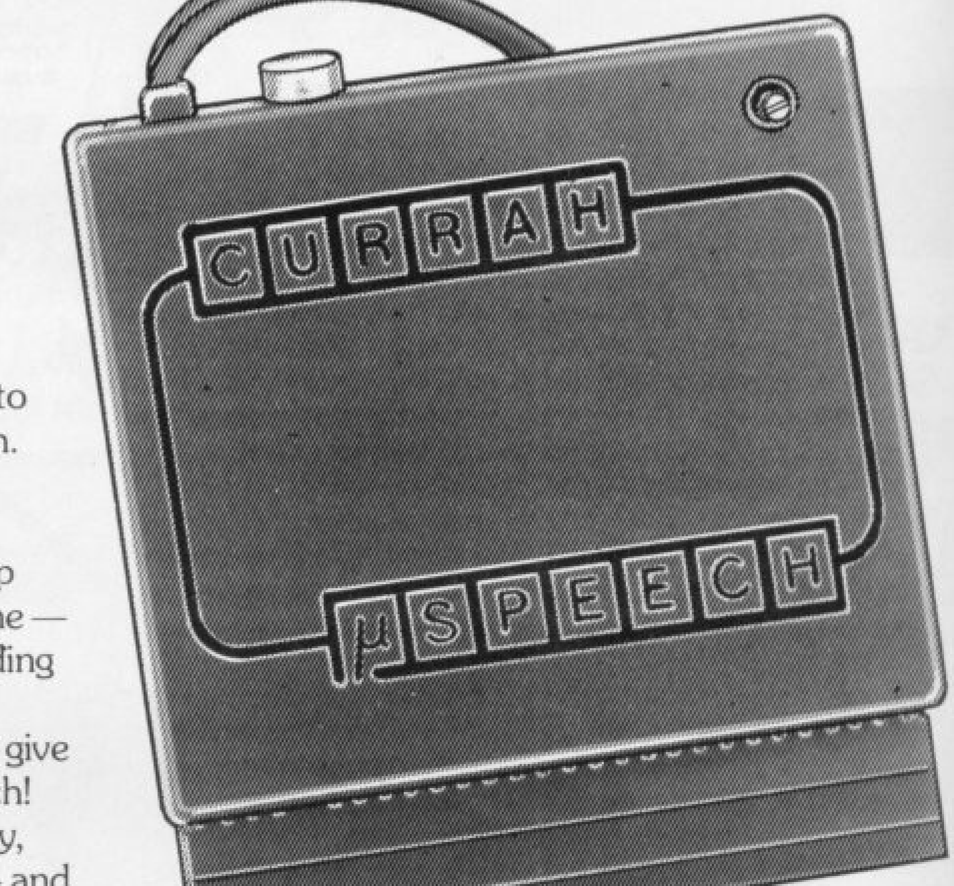
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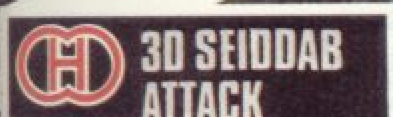
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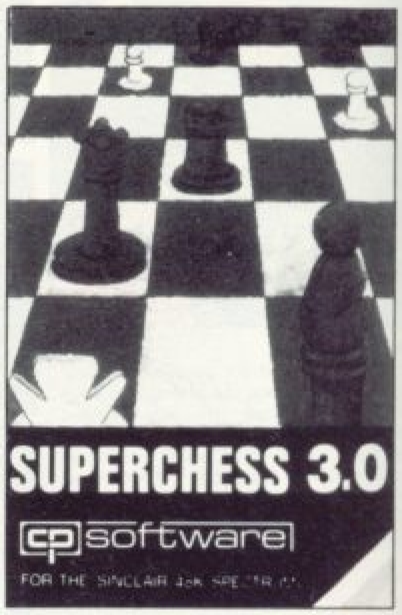
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Interface games are fast but not furious

John Gilbert reviews the ROM cartridge software currently available

THE SINCLAIR Research Interface Two has had few kind words said about it and that it is not surprising. The add-on is supposed to give the Spectrum the ROM potential of the Atari games consoles and computers into which you can plug ROM cartridges which will load games into the machine directly on power-up. It should have been the ideal add-on for users who want a quick-load device and no messing with tape recorders or even Microdrives.

The main difficulties with the idea are that the software available consists of reproductions of arcade games which are already on the market and that many software companies have been deterred from producing software for the Interface because of the conditions attached to ordering.

At the moment companies have to order batches of 1,000 cartridges in a sector of the market which is not fully-established. It is a risky business even for a company as established as Melbourne House or Psion. The situation could develop so that Sinclair is the only company producing the ROM cartridges. It certainly has the monopoly now.

The first ROM packages, together with their colourfully-styled display boxes, to arrive on the market were titles which already existed on the cassette format in the Sinclair software library. They included **Planetoids, Backgammon** and **Space Raiders** which are all from Psion.

The packages, one of which appeared originally on the ZX-81, are not particularly innovative or awe-inspiring and they are certainly not the kind of titles which would be expected to be produced when launching a new peripheral for a prime-selling microcomputer. It is as if Sinclair could not wait to get Interface Two out of the way and so complete its obligations for peripherals for the Spectrum. One reason may well have been that the new QL machine was occupying its thoughts.

Backgammon featured as the only mind game in the first release, the others being held back because the Psion games were the quickest to produce. It is a pity that Backgammon was first instead of the chess package, which was left until later — chess has a far greater appeal to the majority of home computer users. Fortunately there was a gap of only two months before **Chess** was released and it has proved to be one of the better software packages in the launch.

Space Raiders is a painfully slow version of Space Invaders and could just

> 'The packages are not innovative or awe-inspiring'

as well be bought on cassette more cheaply. There are three spaceships with which you can fire at the aliens which amble across the screen.

Once you have finished one screen of the game, and that is not difficult, you will progress to the next level which is just as difficult or easy as the first. That makes the game a push-over and there is little challenge to tax even the newcomer to the arcade game scene.

Like most of the games in the range the price of the program on cassette is only £5 but the ROM version costs almost £10. Considering that the software does not show off either the graphics, colour or sound of the Spectrum to best effect it does not seem advantageous to buy the ROM version.

Planetoids is another arcade game with a familiar theme. Your spaceship first appears stationed at the centre of the screen and asteroids start to close in on it. You must try to destroy them and avoid the ones you miss. Alien spaceships make your task even more impossible.

The standard of the game is reasonable for the market, even though it was first produced in late 1982. The graphics are better than the original Atari version of **Asteroids.** The ship and the planetoids have been given a solid, almost three dimensional quality.

The program has a wrapround screen

which allows your spaceship to go off one side and return on the other. That causes a strange effect when your ship fires across the screen, as the missiles will disappear off one edge and re-appear somewhere else. The rogue missiles could even cause you to have some nasty accidents shooting at yourself.

Those packages comprised the ROMs available at the launch of Interface Two and there was a considerable wait until the other ROMs were launched in December.

The new packages include some old favourites from Melbourne House, already in the Sinclair software library, and some releases introduced by Ultimate Play the Game.

The Melbourne House offerings feature the clown of the software scene. The newest Horace adventure is not on ROM but it is pleasant to see **Hungry Horace** having a re-birth and **Horace and the Spiders** on ROM.

For those who know nothing of the Horace myth he is a little round, Pac-man-type creature who has the habit of annoying everyone he meets.

Each of the games has a cute plot and Hungry Horace sees the round man taking the part of a Pac-man. He is, however, no ordinary powerpill eater. He has to eat the flowers in the park and avoid the keepers who will throw him out if he is discovered. If you go through one maze into another there will be more surprises and if you are adept enough you may start to think that there is no limit to the number of mazes in the game.

Horace and the Spiders is slightly different. Horace has to dodge the spiders to gain points before he can reach the main part of the game which takes place in a cobwebbed house. You must destroy the spiders and their webs if you are to win the game.

'The company has no idea which utilities will be available.'

The Horace adventures are a pleasure to play and it is good to see them in a format where they can be loaded immediately you feel like a quick game.

The range of Ultimate games is also worth having on cartridge, although they could be bought more cheaply on cassette from that company.

In chronological order, **Jet Pac** was the first game Ultimate produced for the Spectrum. In it you play a spaceman whose task is to deliver and assemble spaceship kits and to collect valuable treasures on the way. You will be faced with all kinds of odd creatures which you must avoid and destroy to complete your task.

The other games from Ultimate are **Pssst,** which involves a robot keeping away the bugs from a sunflower, and **Cookie,** which involves a chef bouncing ingredients for a cake, avoiding the nasties in the larder and keeping clear of the bins. Both games are arcade standard in quality and benefit from the ROM treatment.

The only mind game in the second release of ROM software is **Chess.** It is the original cassette version which has existed since the title was launched, with no changes. That is surprising since Mikro Gen, the original manufacturer of the game, has produced an upgraded version.

The game is standard so far as computer chess goes with options for playing or setting-up the board to play in particular situations. There are 10 levels and the highest, nine, takes several minutes to make a move. Each move for both you and your opponent is monitored in seconds, minutes and hours on a chess clock above the board on the screen.

The future of the ROM interface is still uncertain and many software houses are unsure what they will do in the way of supporting it. It seems unlikely that any large-scale production of programs on Sinclair standard ROMs is planned in the software industry and Sinclair could be in the unenviable position of having a monopoly of ROM software.

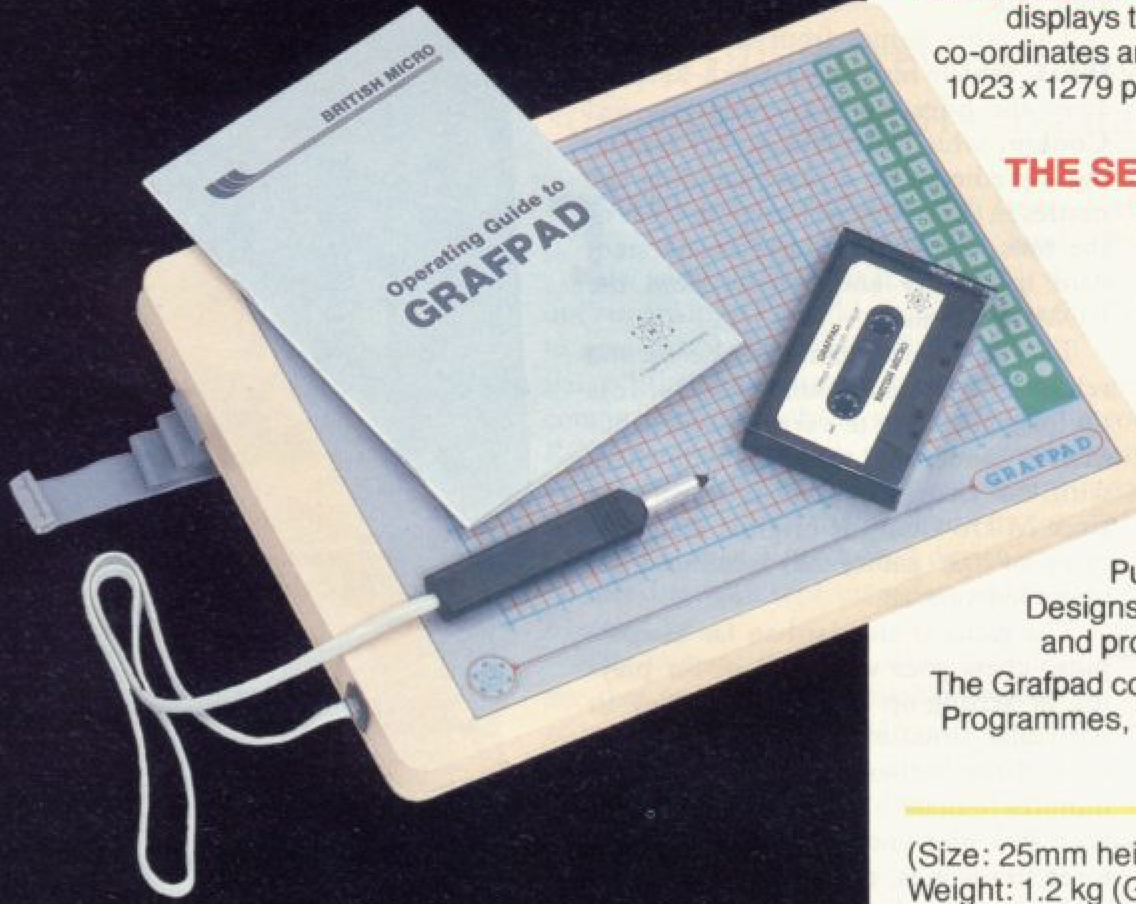
Sinclair Research hopes to produce some language and utility packages for Interface Two but the company still has no idea which language or utilities will be available, or when. It is likely that a ROM version of **Micro-Prolog** will be available soon but no firm date is being given even for that step forward.

The indications are that it will be the last interface for the Spectrum. The buffer at the back of the board will support only a ZX printer and Sinclair has given no intention of producing more peripherals for its home market machine. It would therefore seem logical to support the interfaces it already has as far as it can and to promote the use of those devices as much as possible. As far as Interface Two is concerned it has crept on to the market with more of a whisper than the bang which was expected.



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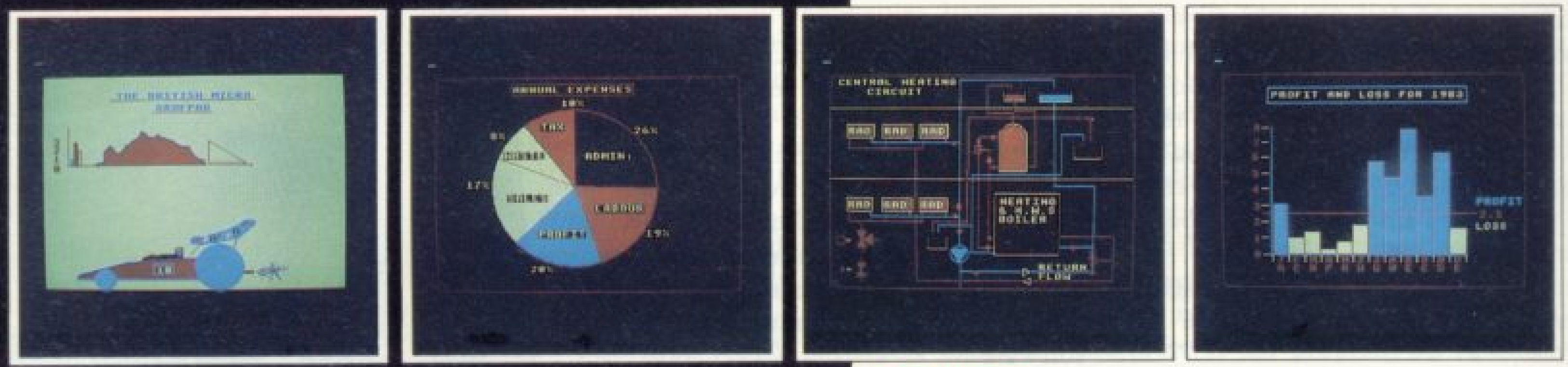
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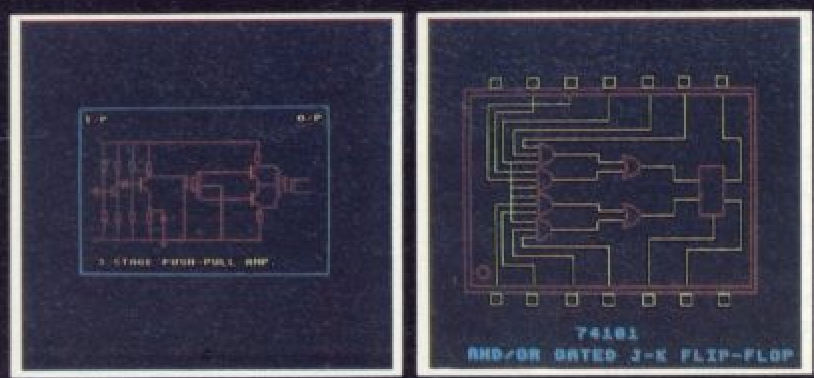
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EMS

March 1984

Sinclair aims at a new market. Mike Wright speculates

QL has real quality

UNTIL NOW, Sinclair computers have been aimed fairly and squarely at the home and educational markets. Although the Spectrum is a versatile machine its lack of proper keyboard and built-in printer interfaces, together with its small display — 32 rows × 22 columns — makes it less than perfect for business users. The introduction of the Sinclair QL goes a long way to meeting the needs of the professional and business community, while still keeping the price — £399 — well within the range of the home computer market.

The QL measures $5\frac{3}{8}$in. × $1\frac{3}{4}$in. × $18\frac{3}{4}$in., weighs just over 3lb. and can be connected to either a monitor or TV. A colour monitor will give a wider screen and a greater resolution than a TV screen. The QL features the Motorola 68008 32-bit processor with 128K of user RAM; 32K is reserved for the screen display, which in its highest resolution gives 512 × 256 pixels in four colours or 256 × 256 pixels and eight colours.

There is also a 65-key full-travel keyboard. The introduction of the keyboard also means the abolition of the traditional use of key words. It is complete with two built-in Microdrives, which are improved versions of the Spectrum Microdrive and are not compatible with the Spectrum, although with re-formatting the cartridges will be.

Other features include the ability to run more than one program at any time — multi-tasking — and the capability to connect up to 64 QLs and/or Spectrums via its QDOS operating systems.

The QL is also equipped with a sophisticated suite of four business packages. They are a spreadsheet — Abacus; database — Archive; word processing — QL Quill; and a business graphics package — Easel. The programs have been developed by Psion for Sinclair Research in the last 18 months and are described by Psion managing director David Potter as "more powerful and functional than existing products for desk-top computers costing up to £5,000".

The QL is regarded by Sinclair as setting new industry standards for value, performance, quality and user-friendliness. It is also seen as the centre of an extremely powerful system, reported to be a workstation developed with ICL, and there are already major enhancements in the pipeline. They include a ½MB or 512K expansion RAM, a Pascal compiler, a 68000 assembler, a hard disc interface, a modem, and a Centronics parallel printer interface with multi-channel sound generator.

The computer, although aimed at the top end of the amateur and home computer markets, is also intended to attract orders from small and large businesses. From a businessman's point of view, the QL can be seen to be a very exciting development, particularly with its price tag and size of memory.

Before it can be put to use a monitor

continued on page 58



The Sinclair QL with 0.5 Megabyte RAM expansion board (optional)



Reaching into the future?

continued from page 57

or TV, and a printer will need to be added. That will add about another £300 for a colour monitor and £250 for a reasonably good-quality dot matrix printer to complete the system.

With the networking facility it means that although monitors or TVs are needed for every machine, one printer is all that is needed for all the computers linked in the network.

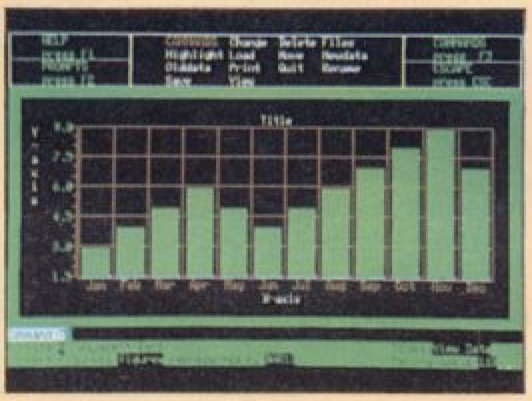
The QL multi-tasking feature allows several programs to be run at once. That was demonstrated at the launch by having the computer run three separate programs, each scrolling text in a different direction, in different areas of the screen at the same time. Initially the possibilities of it for useful applications may look few and far between but it is a big step forward in having one program printing without the user having to wait for it to finish before he can perform another task in another program.

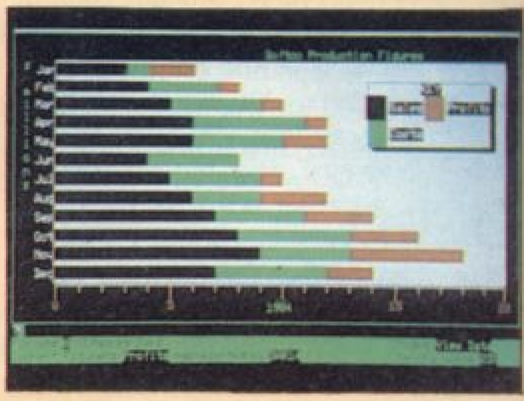
Networking

With the coming of the QL a very exciting development in the field of education can be visualised, a computing laboratory in which the teacher, with a QL, and every member of the class with a Spectrum or QL is linked in a local area network. The teacher would be able to monitor and display the work of up to four pupils at once in separate windows on the QL, rather like the language laboratories which were the rage in schools not so long ago.

Despite the claims that the QL is less than half the cost of any comparable business machine, there remain several points which must be worrying to potential business users. The most major of them is the decision to stay with the Microdrives, although in an updated and improved form, instead of using floppy discs as back-up storage. Since the introduction of Microdrives last year, some experts have been worried by the performance of the drives and by the use of a continuous loop of video tape. Further, there is no connection point for a cassette recorder.

For Spectrum users who had hoped to be able to upgrade their machines while still retaining their favourite software, you will be disappointed even if





Examples of the QL Easel business graphics

your program is on a Microdrive cartridge. The QL uses a new improved Super Basic as its language which is radically different from the Spectrum Basic. Although loading from a cassette is a slow, tedious business, a cassette copy of a program is usually fairly reliable and what is more it is cheaper to produce commercial programs on cassette.

The cost of a blank cassette can be as little as 15 pence for large numbers while the cost of a blank Microdrive cartridge is about £5. While on the subject of mass storage it may be interesting to note that Sinclair has plans to produce a hard disc interface while it has no plans either to produce a disc drive or a floppy disc interface. The cost of a hard disc could be two to three times the cost of the computer.

Inserting Microdrive cartridges



Perhaps one other point to consider for users with large amounts of data is that once the RAM expansion has been fitted the QL has 640K of RAM, yet each Microdrive cartridge holds only a maximum of 100K.

Omission

In keeping down the cost of the QL Sinclair Research may have sinned, by omission, for business users. The industry-standard interface for printers is the parallel or Centronics interface yet the QL is equipped with two RS232C ports and two joystick ports but no Centronics port. Because the Centronics is the standard, most printers are fitted with it and then offer the option of a RS232 interface at extra cost. Alternatively the user can wait for the Centronics interface to be produced and use that, at extra cost.

Despite those minor reservations, the QL promises to be a major revolution for businessmen who want real computing power at moderate cost.

While many others will spend a long time arguing and debating the merits of the hardware, interest for many lies in the suite of applications programs written by Psion for the QL. They have been designed for their usability by a mass market with no prior training or pre-knowledge using the concepts of Inform and Decide, Do and See and What You See is What You Get. Because of the nature of the design it is said that even the most inexperienced person can carry-out useful tasks immediately, while experienced users can achieve a remarkable level of sophistication.

The suite consists of a word processor, a spreadsheet, a database and a business graphics program. They are integrated in style, structure design and perhaps most important in the sharing of information. The last feature allows data to be transferred between programs



so that data from the database or spreadsheet can be transferred to QL Easel, where it can be represented graphically and from whence it can be moved anywhere into a document in QL Quill ready for printing.

Although the QL manual contains large sections on all four programs, information on the current status and options available are displayed in English at the top of the screen. If the user still is lost at any time, pressing the key F1 will call up a HELP screen of relevant information with the option of further HELP pages. Return, via the ESC key, is to precisely the point in the program the user left.

QL Quill has all the features of a modern word processor, plus some unusual ones such as viewing wide documents to check for layout and the input of data tables and graphs from other parts of the suite.

It certainly seems to have impressed Sir Clive Sinclair, since at the launch he said "for £800 you can have a word processor better than anything you can buy currently."

QL Abacus is the spreadsheet with 256 rows and 64 columns generating more than 16,000 cells and working to an accuracy of 16 significant figures. One of the major features of Abacus is the ability to refer to rows, columns and even cells by user-defined names, instead of having to remember the co-ordinates of cells.

For example, if row 1 is labelled sales and the columns are labelled with months and years, e.g., Jan 80, then any cell can be found by referring to, for example, sales Mar 84 instead of struggling to work out the co-ordination of the cell.

Databases by their nature are usually more complicated to use than most business programs, since to have them perform to their utmost a measure of programming is usually required. QL Archive is no different, although its language is similar to Sinclair Super Basic and it has a powerful card index program. To make the maximum use of memory, Archive allows fields and records of variable lengths.

QL User Bureau

QL Easel is an impressive graphics package. It is fully interactive so that when data is entered it is shown on the screen immediately in a visual form — for example, as a bar on a bar chart. The bar chart can be changed into a pie chart or line graph fairly easily. The colours, shading, design and presentation of the graphs can also be changed easily.

Before a computer and software is bought, thought must be given to the level of support it will be given with both the machine and software. In an attempt to meet that Sinclair is providing an optional service known as QLUB — QL User Bureau. The cost is £35 per year and for that the user will receive six newsletters, a free update of each of the four programs each year, and the first option on buying new peripherals. In addition, Psion will provide a business query reply service not available to non-members.





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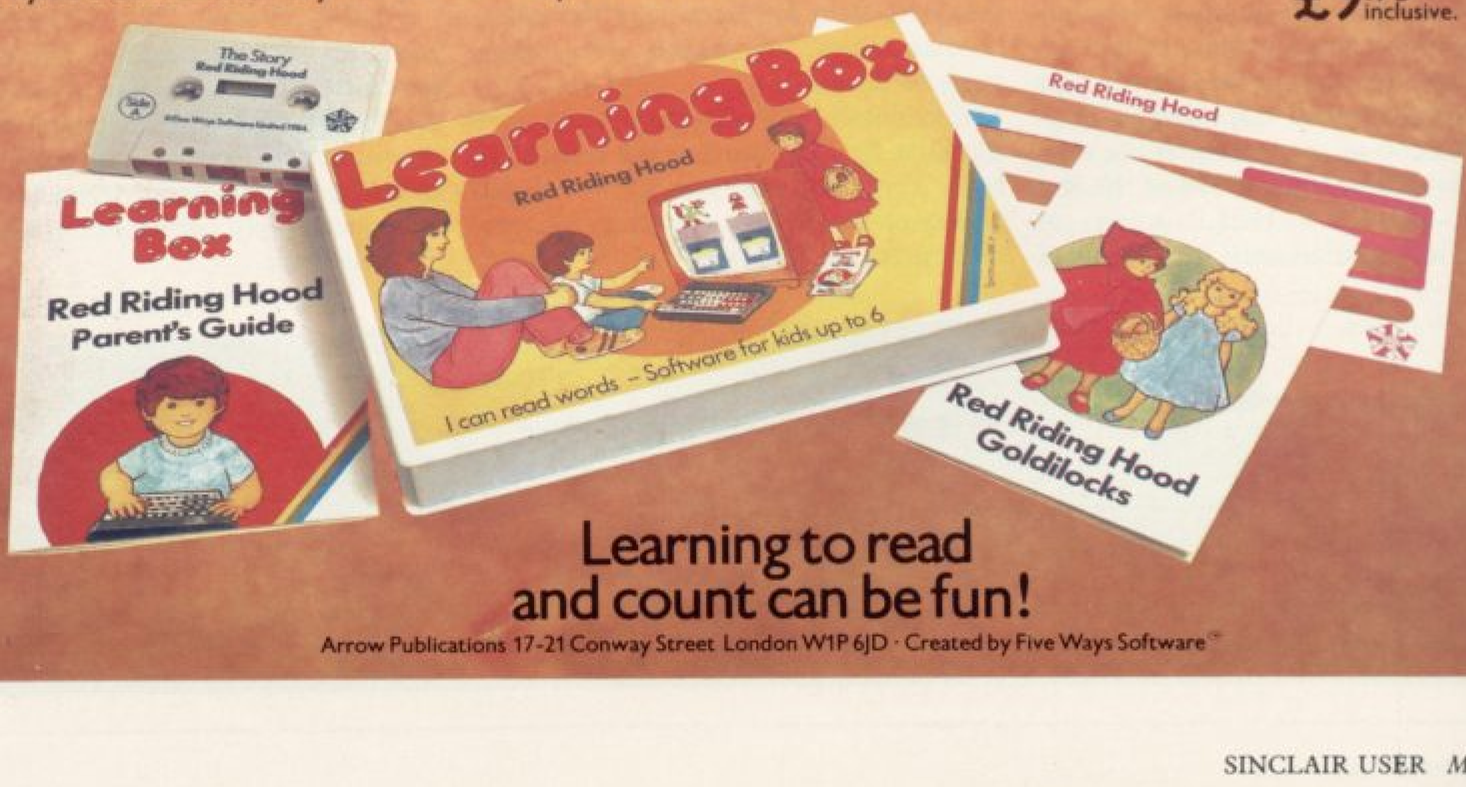
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The overall winner will receive the Sinclair peripherals, the 10 runners-up a LEARNING BOX of their choice.

Competition Rules

1. The competition is open to UK residents only.
2. Employees of those companies involved in the promotion, their agents and families are excluded from entry.
3. Each entry must be on an official entry form.
4. Entries should be sent to Learning Box Competition, BW House, 11 West Street, London WC2H 9NF.
5. The organisers take no responsibility for any loss or damage whatever arising out of the competition. Proof of posting of entries will not be accepted as proof of delivery.
6. There is no alternative to the prizes which must be taken as specified on the entry form.
7. Competitors may make as many entries as they wish providing each one is on a separate entry form.
8. Entries which do not comply with these rules will be disqualified.
9. No correspondence may be entered into and the judge's decision on all matters relating to the competition will be final.
10. Entries will not be returned. Copyright on all entries shall rest in and belong to Arrow Publishing absolutely.

How many Learning Box programs are there?	2 ☐	4 ☐	6 ☐	8 ☐
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Nicole Segre talks to Adrian Sherwin about a top programmer's flights of fancy

Bee line to success

IN NOVEMBER Bug-Byte Software of Liverpool released a program for the 48K Spectrum which made a dramatic departure from the all-too-familiar space vessels, robots, monsters and dungeons of computer games. **The Birds and the Bees** introduced "for the first time on screen" Boris the Bee, whose mission is to flit from flower to flower collecting pollen to take back to its hive.

At the same time, it has to avoid a mounting series of dangers such as birds, Venus fly-traps, spiders' webs, a bear, and a swarm of wasps. Within a month, the game had sold almost 10,000 copies and seemed set to continue making steady progress in the popularity charts.

The talent behind the unusual and refreshing game is Adrian Sherwin, one of the leading hopefuls in the Bug-Byte stable of bright young programmers. He has been writing games since he was 13 and, at the ripe old age of 16, has already sold four games to commercial software houses. He is working on the fifth and were it not for the demands on his time made by his continuing education, could well be writing many more.

> 'At the ripe old age of 16, he has already sold four games'

Sherwin was introduced to computers at Mosslands School, the boys-only Liverpool comprehensive where he is now studying for A levels. "The school has about 10 BBC micros now," he says, "but three years ago our electronics teacher had to bring in his Tandy to introduce us to some of the rudiments of computing."

Sherwin was so absorbed by the subject that he sent immediately for a ZX-80, swopping that for a Spectrum as soon as the new machine appeared on the market. In those days he had no money, so he had to persuade his parents it was a good idea for them to buy him the expensive new toy. "I didn't have too much trouble," he says. "I told my father he could use it in his jewellery business but he never has done. He's computer illiterate," he adds with a note of pity.

From the start, Sherwin was spending about two hours a day with the computer and writing simple games of the space invader type. With the help of Toni Baker's book, *Mastering Machine Code on your ZX-81,* he learned machine code and proceeded to read Rodney Zaks' *Programming the ZX-80* to help him master assembly language. He also bought an assembler program.

Thus armed, Sherwin wrote **Caterpillar,** which was based on the arcade classic Centipede, and sent it to Ocean Software, then called Spectrum Games. The company accepted the game, as it did his next one, called **Robotics** and based on Berzerk. Another famous arcade game, Missile Command, formed the basis for Sherwin's third tape for Ocean Software, **Armageddon.**

Meanwhile, he had been introduced to Matthew Smith, the author of one of the best-known Bug-Byte products, **Manic Miner.** Smith was in the year ahead of Sherwin at school and was willing to help him further his programming career. Thanks to Smith's good offices, Sherwin was lent a Tandy Model 3, with its disc drive and superior keyboard, on which to start writing the Birds and the Bees for the Spectrum.

"We had seen what he had done for Ocean," says Bug-Byte director Tony Baden, "and were keen for him to try something for us."

The idea for The Birds and the Bees emanated from Sherwin's younger sister Kay, now aged 14. "I asked her for some suggestions, he says, "and she produced several. That was the one which appealed most to me."

Sherwin started to write the program when school broke up for the summer and had finished it in two weeks, all except for the graphics. "When he first showed it to us, it consisted mainly of shapeless blobs," says Tony Milner of





Bug-Byte. Fortunately, Smith had already offered to help with the graphics and together they set to work, with the aid of a graphics designer program which Smith had already written. "It made things much quicker and easier," says Sherwin, "and we had the game finished and bug-free by the end of the holidays."

One of striking features about The Birds and the Bees is the way in which Boris the Bee swoops and dives, rather than travelling in predictable straight lines. Sherwin achieved that by giving each key movement a velocity factor. "The idea was Isaac Newton's," he says. "I just used it to make the game more lifelike." It also makes the game more difficult to play but Sherwin has managed to get as far as the swarm of wasps — the highest level — which proves the feat is not impossible.

Sherwin's latest project is a sequel to The Birds and the Bees, to be called **Antics.** The details are not yet finalised but it is likely that Antics will introduce a new character, Boris' cousin Barnaby — or Barnabee — who will attempt to rescue Boris from the ant-hill in which he finds himself — for mysterious reasons which the author declines to elucidate.

The title sequence is all that has been completed so far and features a fugue in "Bee" minor which, in the words of Milner, "sounds very good and goes on forever."

Bug-Byte has secured first option on the first three games which he produces using the company Tandy and Sherwin already has the idea for the third one. "But I'm not telling anyone," he says firmly.

Although Sherwin would have liked to turn to full-time programming, his parents have persuaded him to say at school to take A levels next year. His four subjects are maths, further maths, physics and electronics, and will leave him little time for programming.

Nevertheless, Bug-Byte approves of his decision to gain some sound qualifications, perhaps returning to programming later. "The days of the freelance programmer making an easy killing are numbered," says Baden. "We are gradually turning over production to a team of programmers working full-time but who knows how the market will develop?"

Unlike other bright young Liverpool games authors, such as Imagine Software's Eugene Evans, who once complained publicly that he could not get a credit card because of his age, even though he had earned £30,000 that year

'Good machine code programmers are few and far between'

— or even Smith with his fast-selling Manic Miner — Sherwin has not yet earned a fortune. Yet, he has still made more money than most 16-year-olds; so far he has bought an Atari 800 with a disc drive from his proceeds and put the rest to earn interest in a building society account. "I shall wait till I have learned to drive before I buy a car," he says.

Apart from his obvious flair for mathematics, Sherwin does not know what makes him a good programmer, although he agrees with Milner that good machine code programmers are few and far between. "When you are using machine code," he says, "you have to be able to break down each aspect of your program into many small components and then keep track of them all. That is why an assembler is such a help, as it saves having to deal with so many numbers."

Writing games takes most of the time Sherwin has left from his studies. Apart from snooker, he tries to avoid all forms of sports, and although he likes films — "any films," he says — his interest in books is limited mainly to horror stories by James Herbert.

He lives south of the river in Wallasey with his sister and parents, who so far, he says, have been happy to let him program to his heart's content. Wherever his studies may lead him, so far he shows no signs of wanting to stop.

Spectrum Top Ten

Program	Last month	Company	Memory
1 Atic Atac	1	Ultimate	48K
2 Jet-Pac	4	Ultimate	16K
3 Pyramid	5	Fantasy	48K
4 Kong	6	Ocean	16K
5 Ant Attack	3	Quicksilva	48K
6 Penetrator	—	Melbourne Hse	48K
7 Alchemist	—	Imagine	48K
8 Lunar Jetman	2	Ultimate	48K
9 Pool	10	CDS	16K
10 Harrier Attack	—	Durrell	48K

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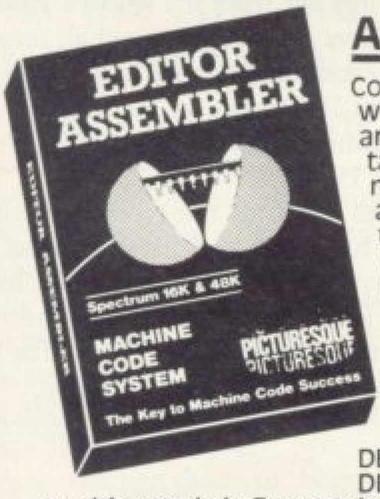
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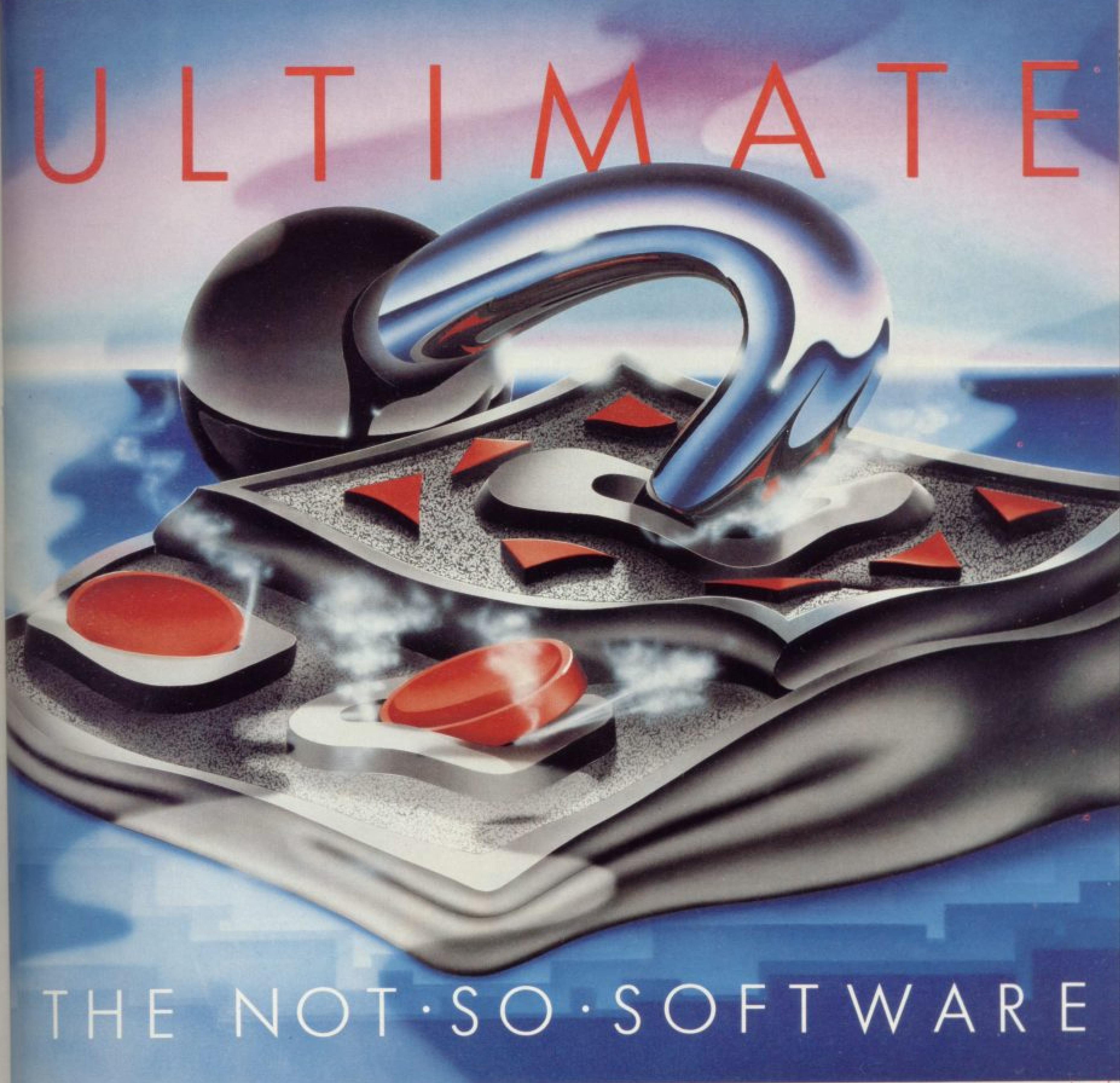
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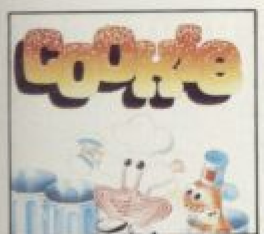
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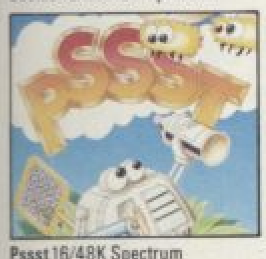
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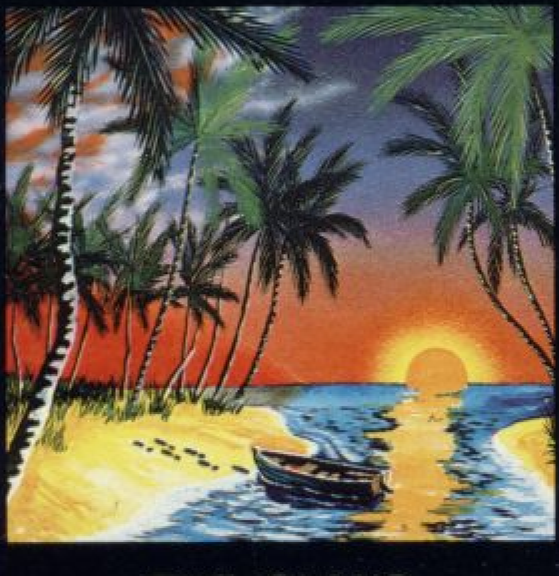
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Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. Thus "6*isp" means six inverse spaces and "(g4:4*i4:g3)" would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.

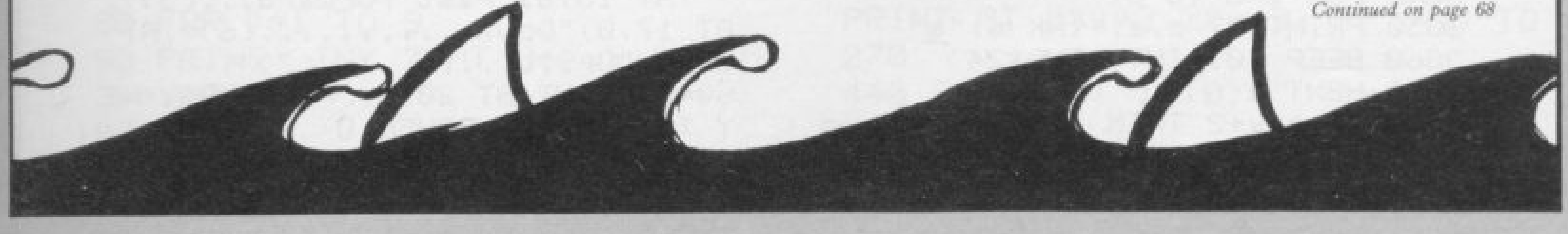
JAWS

YOU ARE swimming in the sea in search of treasure. Watch for the man-eating shark and the crabs which appear at random. As the game progresses the sea bed rises, giving you less room to manoeuvre, and it becomes more difficult to escape the shark and avoid the crabs.

Jaws was written for the 48K Spectrum by Mark Hubbuck of Newport, Shropshire.

```
  30 GO SUB 6000
  40 LET highscore=0: LET n$=""
  50 LET s=1: LET z=22: LET u=0:
 LET treasure=0: LET lives=3: LE
T char=164: LET yd=0: LET xd=0
  60 LET x=INT (RND*13): LET y=I
NT (RND*(z-3))+1
  70 LET x1=INT (RND*12)+18: LET
 y1=INT (RND*(z-3))+1
  80 GO SUB 3000: GO SUB 1000
 100 LET u=u+1: IF u=35 THEN  GO
 SUB 3005: RESTORE : GO SUB 1000
: LET u=0
 110 IF RND<.22 THEN  GO SUB 200
0
 120 IF RND<.07 THEN  GO SUB 210
0
 130 FOR t=1 TO 2
 140 LET xd=-1
 150 LET a$=INKEY$
 160 IF a$="5" THEN  LET xd=xd-1
 170 IF a$="7" THEN  LET yd=-1
 180 IF a$="6" THEN  LET yd=1
 190 LET y1=y1+yd: LET x1=x1+xd
 200  IF ATTR (y1,x1)=171 OR ATTR
 (y1,x1+1)=171 OR ATTR (y1+1,x1)
=171 OR ATTR (y1+1,x1+1)=171 THE
N  GO SUB 4000
 210 IF ATTR (y1,x1)=41 OR ATTR
(y1,x1+1)=41 OR ATTR (y1+1,x1)=4
1 OR ATTR (y1+1,x1+1)=41 THEN  G
O SUB 5000
 220 GO SUB 800
 230 IF xx1<0 THEN  LET x1=30
 240 IF y1=z-1 THEN  LET y1=1
 250 IF y1=0 THEN  LET y1=z-2
 260 LET yd=0: LET xd=0
 270 IF s=1 THEN  GO SUB 700: LE
T s=2: GO TO 290
 280 IF s=2 THEN  PRINT AT y1,x1
; INK 2;"rs";AT y1+1,x1;"tu": LE
T s=1
 290 NEXT t
 300 PRINT AT y,x;"      ";AT y+1
,x;"       ";AT y+2,x;"     "
 310 LET x=x+1
 320 IF y1<y AND y>1 THEN  LET y
=y-1
 330 IF y1>y AND y<z-3 THEN  LET
 y=y+1
 340 IF x=27 THEN  LET x=0
 350 GO SUB 600
 360 GO TO 100
 500 REM *** subroutines ***
 599 REM *** draw shark ***
 600 PRINT AT y,x; INK 1;"a bcd"
;AT y+1,x;"efghij";AT y+2,x;"
lm": RETURN
 699 REM *** draw man ***
 700 PRINT AT y1,x1; INK 2;"no";
AT y1+1,x1;"pq": RETURN
 799 REM *** erase man ***
 800 PRINT AT y1-yd,x1-xd;"  ";A
T y1-yd+1,x1-xd;"  ": RETURN
 999 REM *** set up graphics ***
1000 FOR a=144 TO char: FOR b=0
TO 7: READ c: POKE USR CHR$ a+b,
c: NEXT b: NEXT a
1010 LET char=145: RETURN
1020 DATA 0,0,64,32,32,16,24,12
1030 DATA 0,0,0,0,0,0,3,127
1040 DATA 0,8,12,14,15,15,255,25
```

Continued on page 68



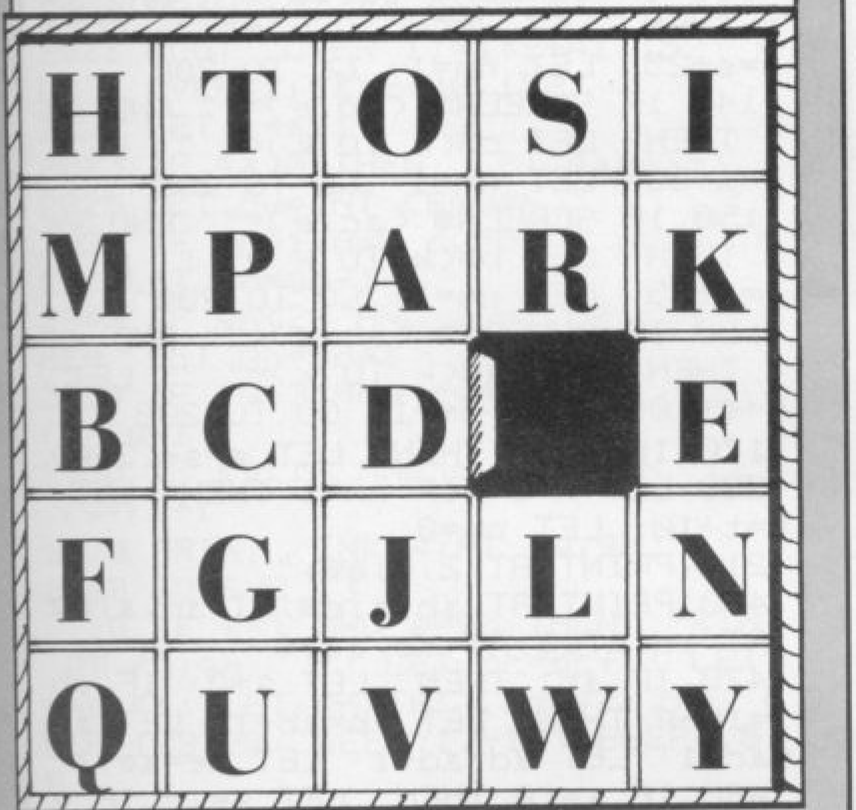
Continued from page 67

```
5
1050 DATA 0,0,0,0,0,128,224,255
1060 DATA 12,15,7,7,7,7,6,4
1070 DATA 3,71,255,255,255,255,3
,2
1080 DATA 255,255,255,255,255,25
5,255,192
1090 DATA 255,255,255,255,255,25
5,255,127
1100 DATA 255,255,255,255,255,25
5,255,240
1110 DATA 224,252,223,254,248,24
0,128,0
1120 DATA 4,8,16,0,0,0,0,0
1130 DATA 7,7,7,6,6,4,0,0
1140 DATA 240,240,224,224,224,19
2,128,0
1150 DATA 0,7,7,6,6,118,118,127
1160 DATA 0,240,240,0,15,15,12,2
52
1170 DATA 127,6,6,254,254,0,0,0
1180 DATA 252,12,15,15,0,0,0,0
1190 DATA 0,0,254,254,6,118,118,
127
1200 DATA 0,0,0,0,15,15,12,252
1210 DATA 127,6,6,7,7,0,0,0
1220 DATA 252,12,15,255,252,0,0,
0
1999 REM *** print treasure ***
2000 PRINT AT INT (RND*(z-3))+2,
INT (RND*29)+1; INK 3; FLASH 1;"
*"
2010 BEEP .15,30: BEEP .03,35
2020 RETURN
2099 REM *** print crab ***
2100 POKE USR "a",51: POKE USR "
a"+1,15: POKE USR "a"+2,111: POK
E USR "a"+3,159: POKE USR "a"+4,
47: POKE USR "a"+5,69: POKE USR
"a"+6,32: POKE USR "a"+7,24
2110 POKE USR "b",204: POKE USR
"b"+1,240: POKE USR "b"+2,246: P
OKE USR "b"+3,249: POKE USR "b"+
4,244: POKE USR "b"+5,162: POKE
USR "b"+6,4: POKE USR "b"+7,24
2120 PRINT AT INT (RND*(z-4))+2,
INT (RND*28); INK 1;"ab"
2130 BEEP .15,-20: BEEP .05,-40
2140 RESTORE : GO SUB 1000
2150 RETURN
2999 REM *** set up screen ***
3000 BORDER 1: PAPER 5: CLS
3010 PRINT AT 0,2; INK 6;"Treasu
re:"; INK 3; BRIGHT 1;treasure;A
T 0,23; INK 6; BRIGHT 0;"Lives:"
; INK 3; BRIGHT 1;lives
3020 IF z=8 THEN  LET z=21: GO T
O 3000
3030 LET z=z-1: FOR b=0 TO 7: PO
KE USR "a"+b,INT (RND*255)+1: NE
XT b
3040 FOR a=0 TO 31
3050 PRINT AT z,a; INK 6;"a"
3060 BEEP .01,INT (RND*24)
3070 NEXT a
3080 IF z=y+2 THEN  LET y=y-1
3090 IF z=y1+1 THEN  LET y1=y1-1
3100 RETURN
3999 REM *** collect treasure **
*
4000 GO SUB 800: GO SUB 700: FOR
 a=1 TO 6: BEEP .03,a+10+(21-z):
 NEXT a
4010 LET treasure=treasure+1*(22
-z)
4020 PRINT AT 0,11; BRIGHT 1; IN
K 3;treasure
4030 RETURN
4999 REM *** eaten by shark ***
5000 GO SUB 800: FLASH 1: BRIGHT
 1: GO SUB 700: FLASH 0: BRIGHT
0: FOR a=0 TO -60 STEP -1: BEEP
.03,a: BORDER INT (RND*8): NEXT
a
5010 LET lives=lives-1: PRINT AT
 0,29; INK 3; BRIGHT 1;lives
5020 IF lives=0 THEN  GO TO 5050
5030 RESTORE : LET z=22: LET u=0
5040 GO TO 60
5050 GO SUB 1000
5060 BRIGHT 1: FLASH 1: FOR y=1
TO 21 STEP 3: FOR x=1 TO 30 STEP
 6: GO SUB 600: NEXT x: NEXT y
5070 PAUSE 150
5080 FLASH 0: BRIGHT 0: CLS
5090 PRINT AT 9,0;"You scored ";
treasure
5100 IF treasure>highscore THEN
 LET highscore=treasure: PRINT A
T 11,0;"That is today's best sco
re.     Please  enter your name."
: INPUT n$: GO TO 5130
5110 PRINT AT 11,0;"Today's high
 score is ";highscore
5120 PRINT "by ";n$
5130 PRINT AT 19,0;"Press any ke
y for another go"
5140 RESTORE
5150 PAUSE 0: GO TO 50
5999 REM *** instructions ***
6000 BORDER 4: PAPER 4: INK 7: C
LS
6010 PRINT AT 0,10;"(193:93:193)
 JAWS (193:93:193)"
6020 PRINT AT 2,0;" Can you prev
ent the snapping    jaws of the m
an-eating shark     from eating y
ou.You are a man    swimming in t
he ocean in         search of tre
asures("; FLASH 1;"*"; FLASH 0;"
) which     appear randomly on th
e screen.   Apart from the shark
are crabs   which must also be av
oided and   the seabed gradually
moves up    giving you less room
to          manoeuvre."
6030 PRINT AT 15,0;"The keys are
:";AT 16,0;"Fast forward...(5)";
AT 17,0;"Down..........(6)";AT
18,0;"Up............(7)"
6040 PRINT AT 20,5;"PRESS ANY KE
Y TO START": PAUSE 0: RETURN
```

LETTER MOVE

RE-ARRANGE the letters in the square into alphabetical order, using as few moves as possible. The moves you make are recorded in the top right-hand corner of the screen.

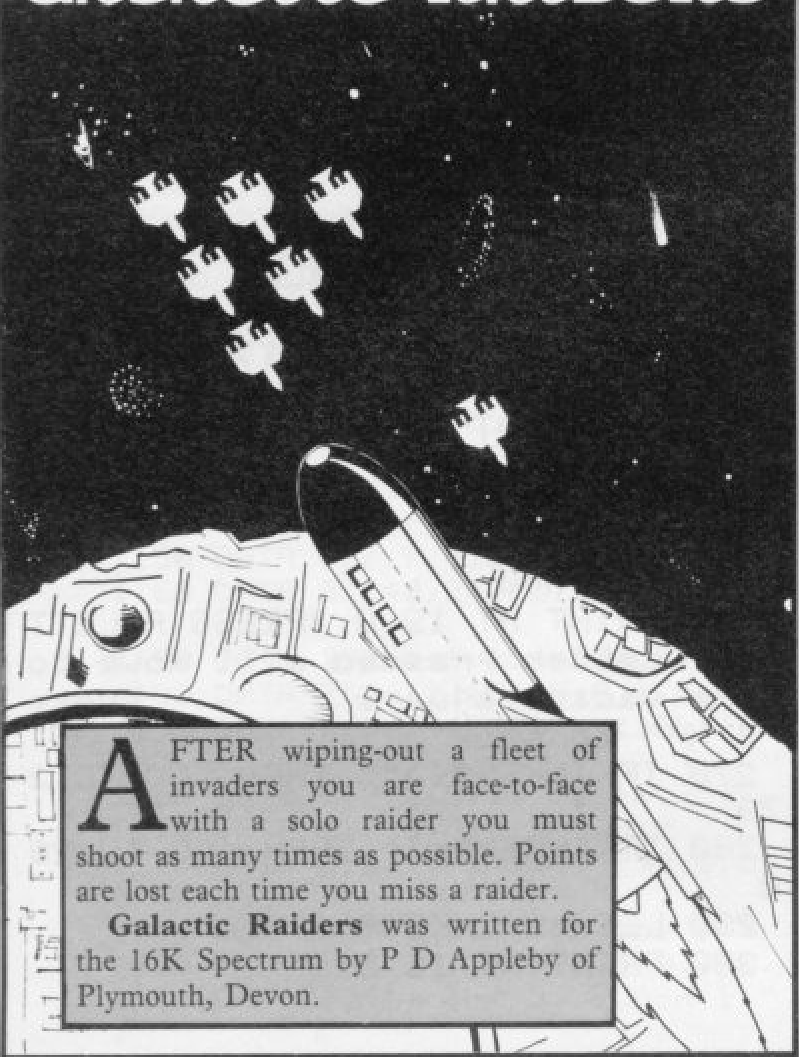
Letter Move was written for the 16K Spectrum by Arthur Lindon of St Helens, Merseyside.




```
  40 CLS : PRINT AT 0,0;"RE-ARRA
NGE LETTERS";AT 1,0;"INTO ALPHAB
ETICAL";AT 2,0;"ORDER";AT 3,0;"a
s shown";AT 4,0;"below:-";AT 6,2
;"ABCD";AT 7,2;"EFGH";AT 8,2;"IJ
KL";AT 9,2;"MNO "
  50 PRINT AT 0,22;"MOVES 0"
  60 POKE 23658,8
  70 PRINT  INK 7;AT 3,9;"******
*****";AT 13,9;"***********"
  80 FOR p=1 TO 9
  90 PRINT  INK 7;AT 3+p,9;"*";A
T 3+p,19;"*"
 100 NEXT p
 110 FOR q=1 TO 5
 120 PLOT 16*q+68,139: DRAW 0,-6
4
 130 PLOT 84,155-16*q: DRAW 64,0
 140 NEXT q
 150 LET d$="ABCDEFGHIJKLMNO "
 160 DIM a$(4,4)
 170 FOR y=1 TO 4
 180 FOR x=1 TO 4
 190 LET d=INT (RND*LEN d$)+1
 200 LET a$(y,x)=d$(d)
 210 LET d$=d$( TO d-1)+d$(d+1 T
O )
 220 PRINT AT 2*y+3,2*x+9;a$(y,x
)
 230 NEXT x
 240 NEXT y
 250 LET n=0
 260 PRINT AT 19,0;"PRESS A LETT
ER - Letter pressed will move to
 the vacant square          Press
 ""X"" to stop"
 270 IF INKEY$<>"" THEN  GO TO 2
70
 280 IF INKEY$="" THEN  GO TO 28
0
 290 LET b$=INKEY$
 300 PRINT AT 16,0;"


                  "
 310 IF CODE b$=88 THEN  STOP
 320 IF CODE b$<65 OR CODE b$>79
 THEN  PRINT AT 16,0;"NO """;b$;
""" ON THE BOARD": GO TO 270
 330 LET n=n+1
 340 PRINT AT 0,28;n
 350 FOR y=1 TO 4
 360 FOR x=1 TO 4
 370 IF SCREEN$ (2*y+3,2*x+9)=b$
 THEN  GO TO 400
 380 NEXT x
 390 NEXT y
 400 IF SCREEN$ (2*y+1,2*x+9)="
" THEN  PRINT AT 2*y+1,2*x+9;b$:
 PRINT AT 2*y+3,2*x+9;" ": GO TO
 270
 410 IF SCREEN$ (2*y+5,2*x+9)="
" THEN  PRINT AT 2*y+5,2*x+9;b$:
 PRINT AT 2*y+3,2*x+9;" ": GO TO
 270
 420 IF SCREEN$ (2*y+3,2*x+11)="
 " THEN  PRINT AT 2*y+3,2*x+11;b
$: PRINT AT 2*y+3,2*x+9;" ": GO
 TO 270
 430 IF SCREEN$ (2*y+3,2*x+7)="
" THEN  PRINT AT 2*y+3,2*x+7;b$:
 PRINT AT 2*y+3,2*x+9;" ": GO TO
 270
 440 PRINT AT 16,0;"""";b$;""" C
ANNOT MOVE"
 450 GO TO 270
```

GALACTIC RAIDERS

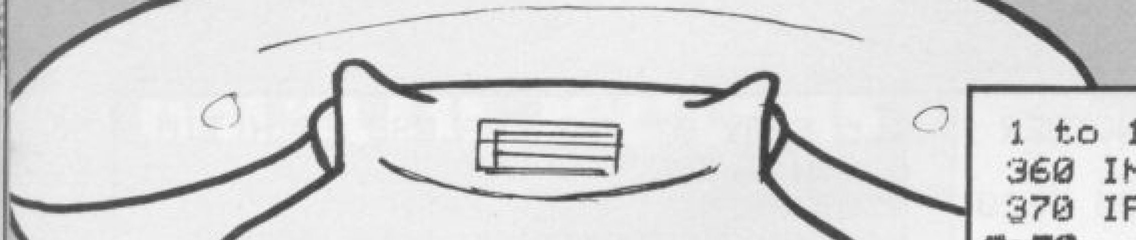


AFTER wiping-out a fleet of invaders you are face-to-face with a solo raider you must shoot as many times as possible. Points are lost each time you miss a raider.

Galactic Raiders was written for the 16K Spectrum by P D Appleby of Plymouth, Devon.

```
 1 INK 7: PAPER 0: BORDER 0: CLS
 3 FOR a=1 TO 30: PRINT INK 7;AT 5,a;"*";AT 15,a;"*": BEEP .1,a: NEXT a
 5 PRINT INK 4;AT 10,8;"GALACTIC RAIDERS": PAUSE 100: CLS
 10 GO SUB 9500
 11 GO SUB 9950
 12 GO TO 20
 13 IF INKEY$="c" AND e>1 THEN PRINT AT 21,e;" ": LET e=e-1: PRINT INK 3;AT 21,e;"b": GO TO 17
 14 IF INKEY$="v" AND e<30 THEN PRINT AT 21,e;" ": LET e=e+1: PRINT INK 3;AT 21,e;"b": GO TO 17
 16 IF INKEY$="n" THEN LET z=e*8+4: INK 7: PLOT OVER 1;z,16: DRAW OVER 1;0,100: BEEP .05,40: PLOT OVER 1;z,16: DRAW OVER 1;0,100: LET x=1
 17 IF s>h THEN LET h=s
 18 PRINT INK 5;AT 0,0;"SCORE";s;AT 0,20;"HIGH";h: RETURN
 20 PRINT INK 7;AT ab,a;a$
 21 PRINT INK 6;AT ac,a;b$
 22 PRINT INK 5;AT ad,a;c$
 23 PRINT INK 4;AT ae,a;d$
 24 IF ae>14 THEN BEEP .005,ae
 40 PRINT INK 3;AT 21,e;"b"
 41 IF ae=21 THEN PRINT INK 2;AT 14,0;"(32*93)": GO TO 1000
 60 LET u=u+1: IF u+p=13 THEN LET m=INT (RND*20)+a: LET n=1
 65 IF n=0 THEN GO TO 103
 85 IF SCREEN$ (ab,m)="" THEN GO TO 95
 90 GO TO 103
 98 FOR c=ae+1 TO 20 STEP 2: PRINT INK 7;AT c,m;"*": BEEP .005,c*3: PRINT AT c,m;" ": NEXT c
 100 LET n=0: LET u=0
 101 IF m=e THEN LET l=l-1: PRINT AT 0,13+l;" ": BEEP 1,20: BEEP 1,40
 102 IF l=0 THEN GO TO 1000
 103 GO SUB 13
 121 IF x=0 THEN GO TO 210
 123 LET k=e-a+1: BEEP .05,-10
 130 IF SCREEN$ (ae,e)="" AND x=1 THEN LET d$(k TO k)=" ": LET s=s+25: LET nm=1: GO TO 200
 140 IF SCREEN$ (ad,e)="" AND x=1 THEN LET c$(k TO k)=" ": LET s=s+50: LET nm=1: GO TO 200
 150 IF SCREEN$ (ac,e)="" AND x=1 THEN LET b$(k TO k)=" ": LET s=s+75: LET nm=1: GO TO 200
 160 IF SCREEN$ (ab,e)="" AND x=1 THEN LET a$(k TO k)=" ": LET s=s+100: LET nm=1: GO TO 200
 170 IF nm=0 THEN LET s=s-(3+p)
 200 LET x=0: IF nm=1 THEN LET t=t+10: LET nm=0
 210 PRINT AT 2,0;e$;"       "
 460 PRINT AT ab,a;e$;AT ac,a;e$;AT ad,a;e$;AT ae,a;e$
 470 IF a=1 THEN LET q=0: IF vb>=10-p THEN LET ab=ab+1: LET ac=ac+1: LET ad=ad+1: LET ae=ae+1
 480 IF a=10 THEN LET q=1: IF vb>=10-p THEN LET ab=ab+1: LET ac=ac+1: LET ad=ad+1: LET ae=ae+1: LET q=1
 485 IF a=1 OR a=10 THEN LET vb=vb+1
 490 IF q=0 THEN LET a=a+1
 500 IF q=1 THEN LET a=a-1
 510 IF t=400 THEN LET t=0: LET s=s+500: BEEP 1/3,10: BEEP 1/3,-6: BEEP 1,20: LET bn=1: PRINT AT 14,0;" ";AT 14,31;" ": GO TO 2000
 520 GO TO 20
1010 PRINT AT 10,11;"GAME OVER"
1020 BEEP 1/3,0: BEEP 1/3,5: BEEP 1/3,7: BEEP 1,12
```

```
1030 INPUT "PRESS y FOR ANOTHER
GAME";z$
1035 IF z$="y" THEN  GO SUB 9620
: GO TO 11
1050 STOP
2000 LET qa=100
2001 PRINT  INK 5;AT 2,0;"BONUS"
: PLOT 41,152: DRAW 200,0
2006 LET gh=INT (RND*20)+5
2007 LET op=0
2010 LET fg=9
2015 LET shot=shot+1
2016 IF l=0 THEN  GO TO 1000
2017 IF shot=12-p THEN  FOR c=fg
 TO 20 STEP 3: PRINT  INK 7;AT c
,gh;"*": BEEP .05,c*3: PRINT AT
c,gh;" ": NEXT c: IF gh=e THEN
LET l=l-1: BEEP 1,20: BEEP 1,40:
 PRINT AT 0,13+l;" ": GO TO 2006
2018 FOR c=1 TO 10: NEXT c
2019 IF shot>=12-p THEN  LET sho
t=0
2020 PRINT AT fg,gh;" "
2021 PLOT  OVER 1;qa*2+41,152: P
LOT  OVER 1;qa*2+40,152
2022 LET s=s-1
2023 IF qa>0 THEN  LET qa=qa-1
2025 LET cv=INT (RND*6)
2030 IF gh>1 AND cv=0 OR cv=4 TH
EN  LET gh=gh-1
2040 IF gh<29 AND cv=1 OR cv=5 T
HEN  LET gh=gh+1
2050 IF fg>3 AND cv=2 THEN  LET
fg=fg-1
2060 IF fg<14 AND cv=3 THEN  LET
 fg=fg+1
2070 PRINT  INK 4;AT fg,gh;"a"
2080 GO SUB 13
2110 IF x=1 AND e=gh THEN  PRINT
 AT fg,gh;" ": LET bc=bc+1: LET
s=s+qa: LET gh=INT (RND*20)+5: B
EEP 1/3,20: BEEP 1,-10: BEEP .5,
5
2112 LET x=0
2115 PRINT AT fg,gh;" "
2120 IF bc<5 THEN  GO TO 2007
2130 PRINT AT 2,0;"
     "
2210 GO SUB 9700
2220 GO TO 20
9500 LET h=0: PRINT "GALATIC RAI
DERS"
9504 PRINT "----------------"
9506 PRINT AT 3,0;"IN GALACTIC R
AIDERS YOU MUST   SHOOT DOWN TH
E RAIDERS BEFORE "; INK 5;"  YO
U ARE SHOT 3 TIMES OR BEFORE  TH
E REMAINING INVVADERS PASS THE GA
TE"
9507 INK 7: PRINT "THE RAIDERS W
ILL STAY AT THE TOPLESS EACH TIM
E YOU CLEAR A SHEET"
9509 PRINT "AFTER EACH WAVE YOU
WILL HAVE TOFIGHT A SOLO RAIDER
AND HIT HIM 5 TIMES BEFORE GOING
 ON TO THE  NEXT WAVE"
9510 PRINT "IF YOU MISS YOU LOSE
 POINTS"
9511 PRINT "WHEN YOU ARE FIGHTIN
G THE SOLO  RAIDER THERE WILL BE
 A BONUS.   THIS WILL GO DOWN.SO
 WILL YOUR  SCORE.YOU GET THE BO
NUS POINTS  IF YOU HIT HIM"
9512 INPUT "PRESS ANY KEY";p$: C
LS
9517 PRINT AT 7,5;"PRESS C TO MO
VE LEFT";AT 8,11;"V TO MOVE RIGH
T";AT 9,11;"N TO FIRE"
9519 FOR a=1 TO 7
9520 READ b: POKE USR "b"+a,b
9530 NEXT a
9540 FOR a=1 TO 7
9550 READ b: POKE USR "a"+a,b
9560 NEXT a
9600 DATA 24,60,126,126,255,255,
255,255,60,126,255,189,153,24,25
5,126
9610 PRINT  INK 7;AT 12,10;"b 10
0 POINTS"; INK 6;AT 14,10;"b 75
POINTS"; INK 5;AT 16,10;"b 50 PO
INTS"; INK 4;AT 18,10;"b 25 POIN
TS"
9620 INPUT "DIFFICULTY(1to5)";p
9630 IF p<1 OR p>5 THEN  GO TO 9
620
9640 CLS : LET s=0
9700 LET a$="a a a a a a a a a a
"
9710 LET b$="a a a  a a a a a a
"
9720 LET d$="a a a a a a a a a a
"
9730 LET c$="a a a a a a a a a a
"
9910 LET bc=0: IF s>0 AND p<10 T
HEN  LET p=p+1
9920 PRINT  INK 2;AT 14,0;"(198)
";AT 14,31;"(198)"
9930 LET vb=0: LET ab=1: LET ac=
3: LET ad=5: LET ae=7: RETURN
9950 LET x=0: LET m=31: LET u=0
9960 LET t=0: LET n=0: LET q=0
9970 LET ab=1: LET ac=3: LET ad=
5: LET ae=7
9975 LET e$="
 "
9980 LET nm=0: LET l=3: LET e=15
9985 PRINT  INK 5;AT 0,13;"3*b"
9987 LET shot=0: LET gh=15
9990 RETURN
```

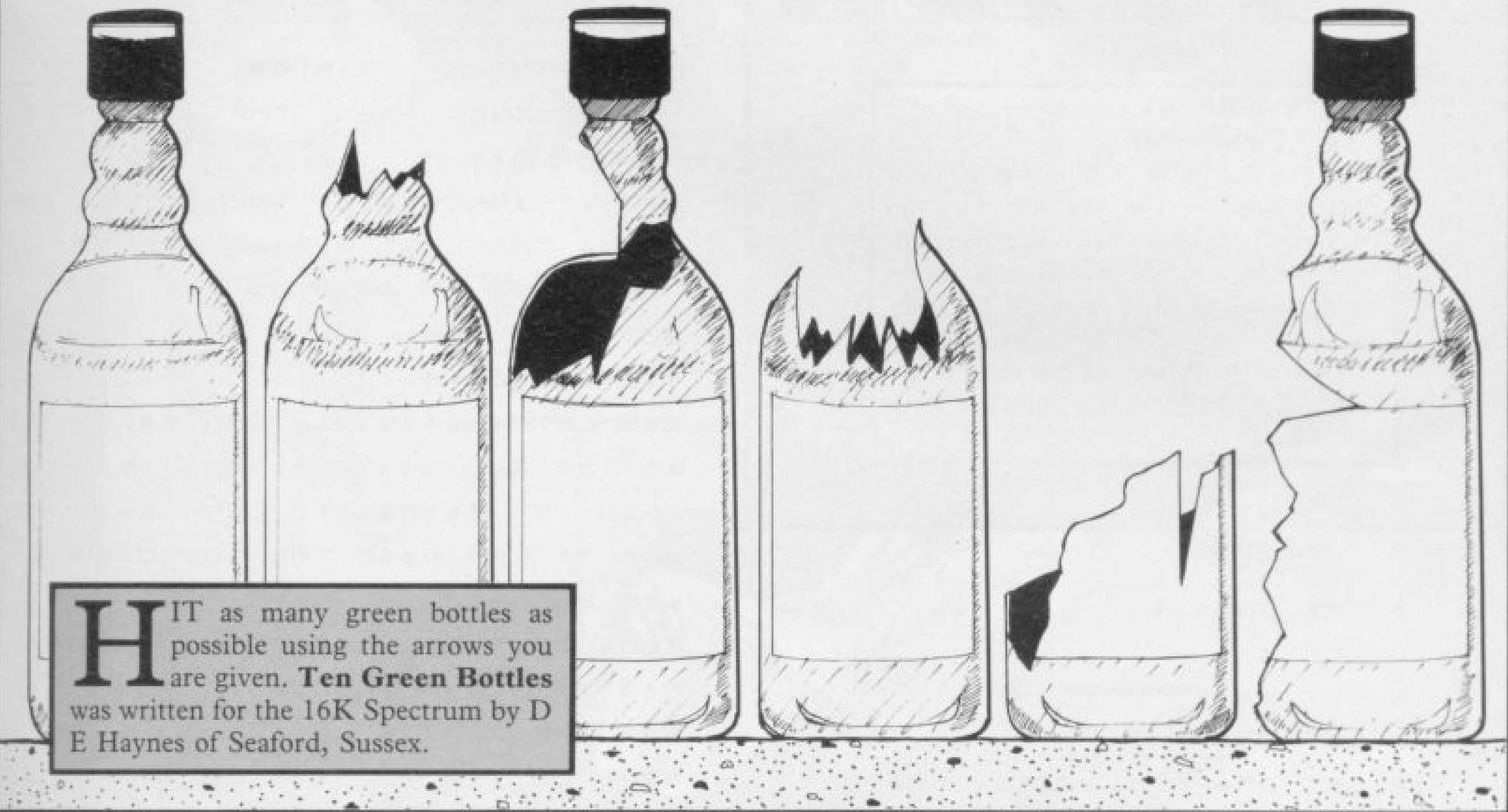


TELEPHONE CALL CALCULATOR

J A WATSON of Wilmslow, Cheshire submitted **Telephone Call Calculator** for the 16K Spectrum. The cost of local and long-distance calls can be calculated if the duration in minutes and seconds is entered. An estimation is given instantly and will help you control telephone bills.

```
  50 CLS
  60 PRINT TAB 4; BRIGHT 1;"TELE
PHONE CALL CALCULATOR"
  70 LET u=.05: REM Unit Rate
  80 PRINT TAB 5;"Charge/Unit= "
;u;" Pence"
  90 PRINT 'TAB 4;"TIME ZONES"
 100 PRINT TAB 4;"(10*93)"
 110 LET a$="Local 6 pm - 8 am"
 120 PRINT TAB 4;a$;TAB 26;"= 1"
 130 LET b$="Local 8-9 am"
 140 PRINT TAB 4;b$;TAB 26;"= 2"
 150 LET c$="Local 1-6 pm"
 160 PRINT TAB 4;c$;TAB 26;"= 3"
 170 LET d$="Local 9 am - 1 pm"
 180 PRINT TAB 4;d$;TAB 26;"= 4"
 190 LET e$="<35 Miles 6 pm - 8
am"
 200 PRINT 'TAB 3;e$;TAB 26;"= 5
"
 210 LET f$=" <35 Miles 8-9 am"
 220 PRINT TAB 2;f$;TAB 26;"= 6"
 230 LET g$=" <35 Miles 1-6 pm"
 240 PRINT TAB 2;g$;TAB 26;"= 7"
 250 LET h$=" <35 Miles 9 am - 1
pm"
 260 PRINT TAB 2;h$;TAB 26;"= 8"
 270 LET i$=" >35 Miles 6 pm - 8
 am"
 280 PRINT 'TAB 2;i$;TAB 26;"= 9
"
 290 LET j$=" >35 Miles 8-9 am"
 300 PRINT TAB 2;j$;TAB 26;"= 10
"
 310 LET k$=" >35 Miles 1-6 pm"
 320 PRINT TAB 2;k$;TAB 26;"= 11
"
 330 LET l$=" >35 Miles 9 am - 1
pm"
 340 PRINT TAB 2;l$;TAB 26;"= 12
"
 350 PRINT 'TAB 5;"(Input choice
1 to 12)".
 360 INPUT r
 370 IF NOT r=INT (r) THEN  GO T
O 50
 380 IF r>12 OR r<1 THEN  GO TO
50
 390 CLS
 400 PRINT TAB 4; BRIGHT 1;"TELE
PHONE CALL CALCULATOR"
 410 IF r=1 THEN  LET q$=a$
 420 IF r=2 THEN  LET q$=b$
 430 IF r=3 THEN  LET q$=c$
 440 IF r=4 THEN  LET q$=d$
 450 IF r=5 THEN  LET q$=e$
 460 IF r=6 THEN  LET q$=f$
 470 IF r=7 THEN  LET q$=g$
 480 IF r=8 THEN  LET q$=h$
 490 IF r=9 THEN  LET q$=i$
 500 IF r=10 THEN  LET q$=j$
 510 IF r=11 THEN  LET q$=k$
 520 IF r=12 THEN  LET q$=l$
 530 PRINT 'TAB 3;"Zone:";q$
 540 PRINT 'TAB 2;"Length of cal
l= ";
 550 INPUT "Minutes ";mi;" ,Seco
nds ";se
 560 IF se>59 THEN  GO TO 550
 570 LET m=((mi*60)+se)/60
 580 PRINT mi;" minutes"
 590 PRINT TAB 18;se;" seconds"
 600 LET s=m*60
 610 REM ***********************
 620 REM z=Time allowed per unit
 630 IF r=1 THEN  LET z=480
 640 IF r=2 THEN  LET z=120
 650 IF r=3 THEN  LET z=120
 660 IF r=4 THEN  LET z=90
 670 IF r=5 THEN  LET z=144
 680 IF r=6 THEN  LET z=45
 690 IF r=7 THEN  LET z=45
 700 IF r=8 THEN  LET z=30
 710 IF r=9 THEN  LET z=48
 720 IF r=10 THEN  LET z=16
 730 IF r=11 THEN  LET z=16
 740 IF r=12 THEN  LET z=12
 750 REM ***********************
 760 LET t=s/z
 770 IF t=INT (t) THEN  LET c=t*
u
 780 IF NOT t=INT (t) THEN  LET
c=(INT (t)+1)*u
 790 PRINT '''''TAB 6; BRIGHT 1;
"Cost of call= £";c
 800 REM ***********************
 810 PRINT #1;AT 1,0; FLASH 1;"S
top, Repeat or Copy (S/R/C)"
 820 IF INKEY$="s" THEN  STOP
 830 IF INKEY$="r" THEN  RUN
 840 IF INKEY$="c" THEN  COPY
 850 GO TO 820
```

TEN GREEN BOTTLES



HIT as many green bottles as possible using the arrows you are given. **Ten Green Bottles** was written for the 16K Spectrum by D E Haynes of Seaford, Sussex.

```
  10 REM "bottles"
  12 FOR n=0 TO 7: READ a: POKE
USR "a"+n,a: NEXT n
  14 DATA 24,24,24,24,24,24,60,1
26
  20 LET a=10: LET s=0: LET t=0
  50 BORDER 4: PAPER 7: BRIGHT 1
: CLS
 200 PRINT  INK 7;AT 11,7;"Ten G
reen Bottles."
 235 FOR n=40 TO 216
 240 OVER 1: PLOT n,56: DRAW 0,7
0
 245 NEXT n
 248 PRINT #1;"PRESS P TO FIRE"
 250 PAUSE 100: OVER 0: CLS
 260 DIM b(31): FOR n=1 TO 31: L
ET b(n)=0: NEXT n
 262 FOR n=2 TO 29 STEP 3: LET b
(n)=b(n)+1: NEXT n
 265 PRINT #1;"PRESS P TO FIRE"
 270 PRINT AT 0,1;"RUNS=";t;AT 0
,12;"HITS=";s;AT 0,22;"ARROWS=";
a
 300 PRINT  INK 4;AT 3,0;" a  a
  a  a  a  a  a  a  a  a"
 305 PRINT  INK 4;AT 4,0;"(2*sP:
198:2*sP:i98:2*sP:198:2*sP:i98:2
*sP:198:2*sP:i98:2*sP:i98:2*sP:i
98:2*sP:198:2*sP:i98:3*sP)"
 310 PRINT  INK 4;AT 5,0;"(2*sP:
198:2*sP:198:2*sP:i98:2*sP:i98:2
*sP:198:2*sP:i98:2*sP:i98:2*sP:i
98:2*sP:i98:2*sP:i98:3*sP)"
 320 LET m=1: LET t=t+1
 322 PRINT AT 0,6;t
 325 PRINT AT 21,m;"^"
 326 BEEP .02,0
 330 IF INKEY$="p" THEN  GO SUB
400
 340 PRINT AT 21,m;" "
 342 BEEP .02,0
 345 LET m=m+1
 350 IF m=31 THEN  GO TO 320
 360 GO TO 325
 400 FOR n=20 TO 3 STEP -1: PRIN
T AT n,m;"^";AT n+1,m;" ": NEXT
n: PRINT AT 3,m;" "
 420 IF b(m)=0 THEN  LET a=a-1
 422 PRINT AT 0,29;a;" "
 424 IF a=0 THEN  GO TO 450
 430 IF b(m)=1 THEN  LET b(m)=0:
 LET s=s+1: PRINT AT 0,17;s: PRI
NT  INK 4;AT 20,m;"(i98)"
 432 IF s=10 THEN  GO TO 454
 435 IF t=20 THEN  GO TO 452
 440 RETURN
 450 PRINT AT 10,1;"NO MORE ARRO
WS.HARD LUCK": GO TO 460
 452 PRINT AT 10,1;"NO MORE RUNS
.HARD LUCK": GO TO 460
 454 PRINT AT 10,1;"NO MORE BOTT
LES.WELL DONE": GO TO 460
 460 PRINT  INVERSE 1;AT 12,5;"G
AME OVER. SCORE=";(4*s)+(20-t)+(
4*a)
```

DEATH BUBBLES

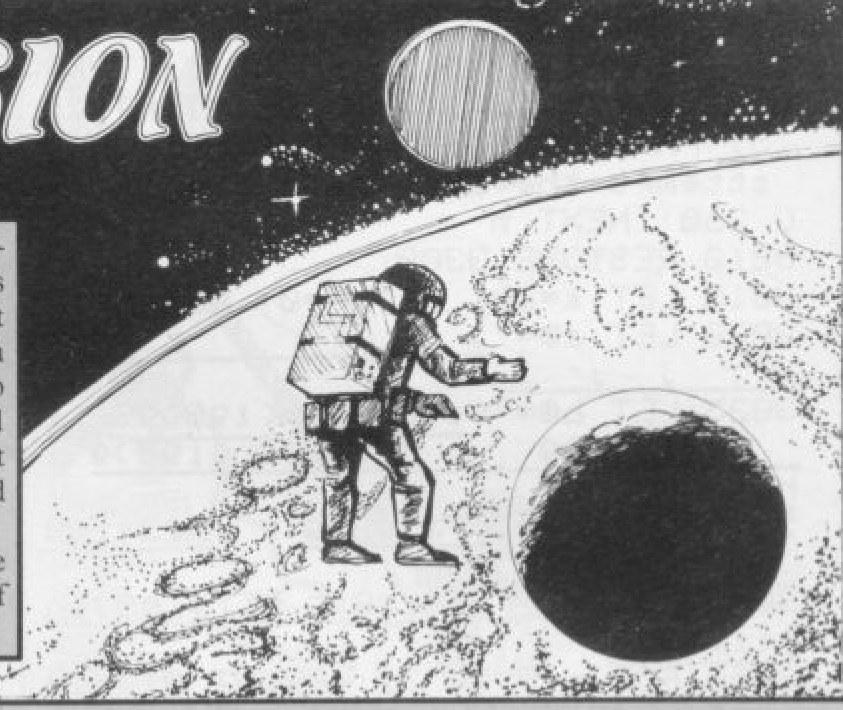
THERE IS a maniac on top of a building dropping nerve gas-filled bubbles. You are the only person who can save the city. Use the cursor keys 5 and 8 to collect the bubbles on your stretcher. As the game progresses your stretcher becomes smaller.

Death Bubbles was written for the 16K ZX-81 by Jonathon Currey of London SE12.

```
   2 LET POP=22
   3 LET S=0
   5 LET B$="███████"
   6 LET A$="          "
  10 LET DF=PEEK 16396+256*PEEK 16397
  15 LET BB=DF+(4*33)+2
  20 LET B=11
  35 LET P$="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
  40 CLS
  50 FOR I=5 TO 20
  60 PRINT AT I,0;"▛▀▀▀▜"
  65 NEXT I
  70 PRINT AT 21,0;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
  75 PRINT AT 12,1;"0000"
  80 LET M=BB
  81 PRINT AT 20,B;B$
  85 PRINT AT 0,0;"POPULATION";P$( TO POP);A$
  86 PRINT AT 12,5-LEN (STR$ S);S
  90 LET D=33+.1+(RND*1.2)
 120 FOR I=M TO M+4
 125 POKE I,52
 130 LET Z=RND
 135 POKE I,0
 150 NEXT I
 155 POKE I,52
 160 LET M=I
 200 POKE M,0
```

```
 210 LET M=M+D
 215 IF PEEK M=3 THEN GOTO 400
 220 IF PEEK M<>0 THEN GOTO 500
 230 POKE M,52
 250 PRINT AT 20,B;A$
 260 IF INKEY$="5" THEN IF B>7 THEN LET B=B-2
 270 IF INKEY$="8" THEN IF B+LEN B$<30 THEN LET B=B+2
 280 PRINT AT 20,B;B$
 300 GOTO 200
 400 LET OS=S
 405 LET S=S+10*(10-LEN B$)
 407 IF INT (OS/250)<INT (S/250) THEN LET B$=B$( TO LEN B$-1)
 408 IF LEN B$=0 THEN GOTO 800
 410 GOTO 80
 500 LET POP=POP-2
 510 IF POP>0 THEN GOTO 80
 515 PRINT AT 0,10;"    "
 520 FOR I=0 TO 31 STEP 4
 530 PRINT AT 0,I;"XXXX"
 540 LET Z=SQR RND
 550 NEXT I
 560 CLS
 570 PRINT AT 2,0;"YOUR WHOLE POPULATION WAS WIPED"
 580 PRINT AT 4,0;"OUT.YOU SCORED ";S;" POINTS."
 590 PRINT AT 8,3;"- PRESS ANY KEY TO PLAY -"
 600 IF INKEY$="" THEN GOTO 600
 610 RUN
 800 CLS
 810 PRINT AT 2,0;"AMAZING YOU SURVIVED.YOU HAD"
 820 PRINT AT 4,0;POP;" THOUSAND PEOPLE LEFT.YOUR"
 830 PRINT AT 6,0;"BONUS IS WORTH ";POP*100;" POINTS"
 840 LET S=S+(POP*100)
 850 PRINT AT 8,0;"TOTAL SCORE=";S;" POINTS."
 860 PRINT AT 10,0;"PRESS ANY KEY TO TRY FOR MORE"
 870 PRINT AT 12,0;"POINTS."
 880 IF INKEY$="" THEN GOTO 880
 890 GOTO 5
```

MOON MISSION



DODGE the poisonous gas bubbles in the first stage of this fast-moving game, then attempt to land on a floating platform. If you manage to do so you then have to jump over the craters to ensure a successful mission. Use keys 5 and 8 in the first two stages and any key in the third stage.

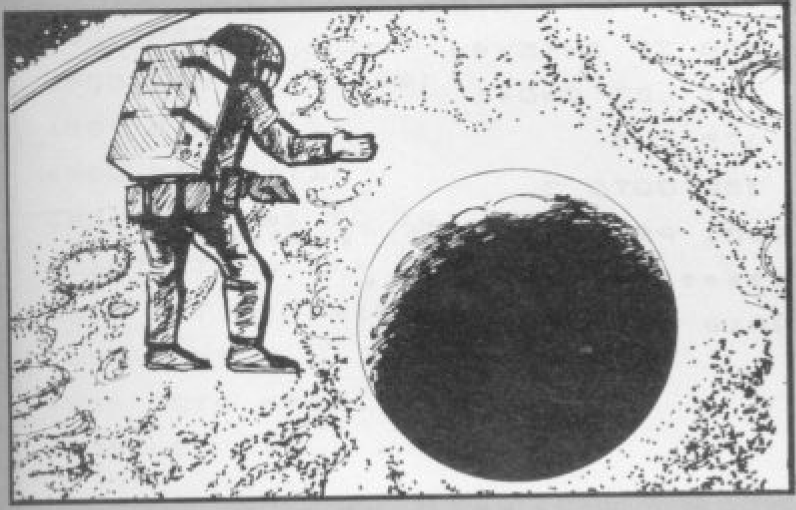
Moon Mission was written for the 16K Spectrum by Ross Henderson of Perth, Scotland.

```
   1 GO SUB 9000
   3 LET z$="MOON MISSION"
   5 PAPER 0: CLS : PRINT AT 1,0; INK 7;z$: PRINT  PAPER 5; INK 0; FLASH 1;AT 7,1; FLASH 0;AT 10,0;"Do you want Mission instructions";AT 13,10;"Press (y/n)": BEEP .1,10: BEEP .1,5: BEEP .1,0: BEEP .5,10
   7 PAUSE 0: IF INKEY$="y" THEN  GO SUB 9500
   9 BORDER 3: INK 7: PAPER 0: BRIGHT 1: CLS
  30 LET xx=INT (RND*25)+5: LET yy=0
  32 FOR z=1 TO 150
  33 IF z>129 THEN  PRINT AT 18,0;"
    ": FOR n=1 TO 10: PRINT ''''': POKE 23692,-1: GO TO 50
  35 LET a=INT (RND*30)+1
  40 PRINT AT 18,a; INK 6;"cd": PRINT AT 19,a; INK 6;"fe"
  43 POKE 23692,-1
  48 PRINT '''''
  50 PRINT AT yy,xx;"a"
  51 BEEP .01,(z/10)-5
  52 IF ATTR (yy+1,xx)=70 THEN GO TO 9998
  60 IF INKEY$="5" AND xx>1 THEN LET xx=xx-1
  70 IF INKEY$="8" AND xx<30 THEN  LET xx=xx+1
 100 NEXT z
2000 CLS : FOR n=0 TO 21: PRINT AT n,xx;"a": PRINT AT n-1,xx;" ": BEEP .05,n: BEEP .05,n-10: NEXT n: CLS : PRINT AT 7,8;"Congratulations": PRINT AT 12,3; PAPER 2; INK 7; FLASH 1;"Now attempt to land at sea": FOR n=1 TO 250: NEXT n
2030 BORDER 3: PAPER 5: INK 1: BRIGHT 1: CLS
2050 LET yy=0: LET xx=INT (RND*10)+20
2060 PRINT AT 20,0;"bbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb": PRINT AT 21,0;"(32*i98)"
2070 LET z=0
2100 PRINT AT yy,xx; INK 0;"a": BEEP .01,-yy+10
2110 IF INKEY$="5" AND xx>0 THEN  LET xx=xx-1: PRINT AT yy,xx+1;" "
2120 IF INKEY$="8" AND xx<31 THEN  LET xx=xx+1: PRINT AT yy,xx-1;" "
2130 PRINT AT 19,z; INK 0;"(i98)": PRINT AT 20,z; INK 0;"(i98)": PRINT AT 19,z-1;" ": PRINT AT 20,z-1;"b"
2140 LET z=z+1: IF z>30 THEN LET z=1: PRINT AT 19,30;" ": PRINT AT 20,30;"b"
2150 IF yy>18 THEN  GO TO 9998
2160 IF NOT yy=18 THEN  GO TO 2170
2165 IF xx=z OR xx=z-1 OR xx=z+1 THEN  GO TO 3000
2225 PRINT AT yy,xx;" ": LET yy=yy+.5
2300 GO TO 2100
3000 FOR n=z TO 31: PRINT AT 18,n; INK 0;"a": PRINT AT 18,n-1;" ": PRINT AT 19,n; INK 0;"(i98)": PRINT AT 19,n-1;" ": PRINT AT 20,n; INK 0;"(i98)": PRINT AT 20,n-1;"b": BEEP .03,n: BEEP .03,n-1: NEXT n
3005 PAPER 5: INK 4: BRIGHT 1: C
```

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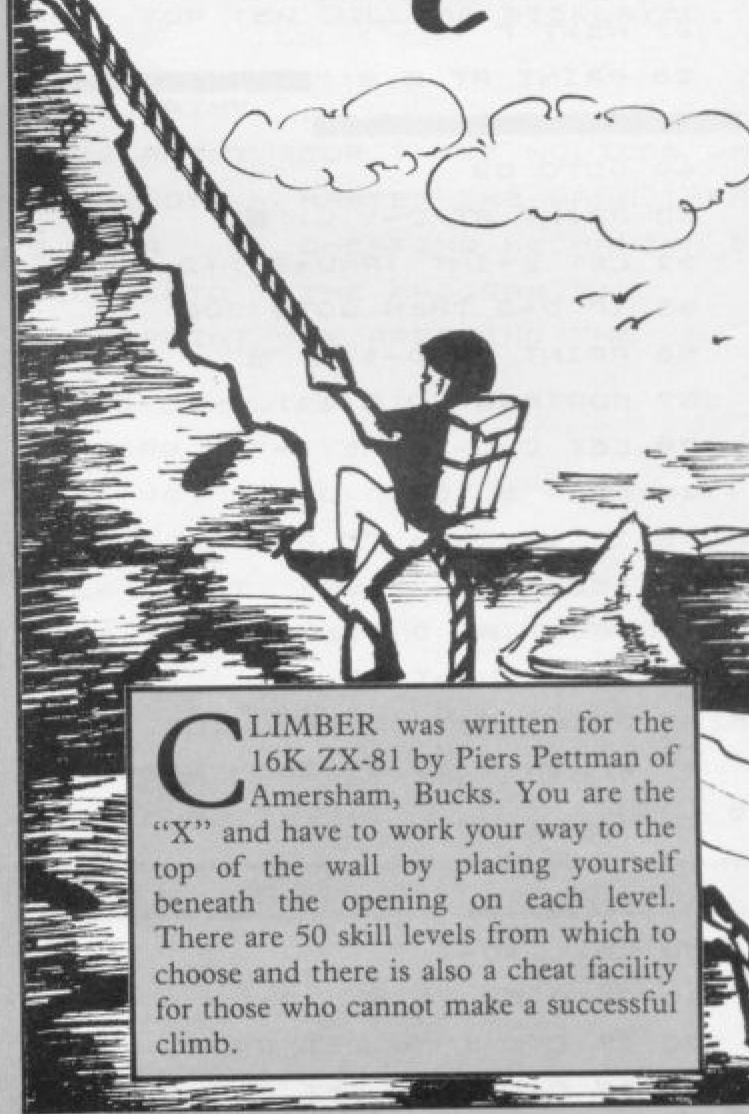
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```
LS : PRINT AT 5,8; PAPER 1; INK
7;"Congratulations": PRINT AT 10
,5; PAPER 2; INK 7; FLASH 1;"Now
 attempt the Craters": FOR n=1 T
O 250: NEXT n
3010 RESTORE 3300
3015 LET a=20: LET p=0: LET xz=0
3020 LET a$="j        j              j
     j   j       "
3025 LET b$="(i98)g   h(i98)g
     h(i98)g        h(i98)gh(i98)g
h"
3030 LET c$="(7*i98)g      h(5*i98
)g  h(10*i98)"
3040 LET d$="(9*i98)g h(7*i98)gh
(11*i98)"
3050 FOR n=8 TO 21: PRINT AT n,0
;"(32*i98)"
3060 NEXT n
3080 PRINT AT 21,0; PAPER 0;"(32
*i98)"
3090 LET f$="(7*i98)g__h(2*i98)h
_h(i98)g__h(2*i98)g__h(5*i98)g__
h(6*i98)g_h(2*i98)g___h(5*i98)g_
__h(i98)g___h(4*i98)g_____h(4*i9
8)g_h(i98)g_h(i98)g_h(11*i98)A G
ood Place for a MOON BASE"(32*i9
8)
3100 PRINT AT a,2; PAPER 4; INK
0;" "
3105 IF INKEY$<>"" THEN  LET p=1
3106 IF xz=135 THEN  GO TO 7000
3107 LET xz=xz+1: LET e$=f$(xz T
O 31+xz)
3110 PRINT AT 4,0;a$
3120 PRINT AT 5,0;b$
3130 PRINT AT 6,0;c$
3140 PRINT AT 7,0;d$
3145 PRINT AT 21,0; PAPER 4; INK
 0;e$
3150 LET a$=a$(1 TO 32)+a$(1)
3160 LET b$=b$(1 TO 32)+b$(1)
3170 LET c$=c$(1 TO 32)+c$(1)
3180 LET d$=d$(1 TO 32)+d$(1)
3185 LET e$=e$(1 TO 32)+e$(1)
3190 LET a$=a$(2 TO )
3200 LET b$=b$(2 TO )
3210 LET c$=c$(2 TO )
3220 LET d$=d$(2 TO )
3225 LET e$=e$(2 TO )
3230 BEEP .01,-a+20
3235 IF a<>20 THEN  GO TO 3245
3240 IF SCREEN$ (21,2)="_" THEN
 PRINT AT 20,1; PAPER 4;"  ": PR
INT AT 21,2; PAPER 2; INK 7; FLA
SH 1;"i": PRINT AT 0,0; PAPER 6;
 INK 0;"    You have failed to co
mplete                the Mission
        ": BEEP 1,-20: GO TO 999
9
3245 PRINT AT a,2; PAPER 4; INK
1;" "
3250 IF p=1 THEN  READ a
3260 IF a=0 THEN  LET p=0: LET a
=20: RESTORE
3300 DATA 19,18,17,16,17,18,19,0
3500 GO TO 3100
4000 STOP
7000 REM Congratulations
7010 PAPER 6: INK 0: BORDER 2: C
LS
7020 FOR n=1 TO 21: PRINT AT n,0
;"a": PRINT AT n-1,0;"(i98)": NE
XT n
7030 FOR n=0 TO 30: PRINT AT 21,
n;"(i98)a": NEXT n
7040 FOR n=20 TO 0 STEP -1: PRIN
T AT n,31;"a": PRINT AT n+1,31;"
(i98)": NEXT n
7050 FOR n=31 TO 0 STEP -1: PRIN
T AT 0,n;"a(i98)": NEXT n
7060 PRINT AT 3,3;"Well Done you
 successfully";AT 6,5;"avoided t
he obstacles";AT 9,5;"and have l
anded safely"
7070 FOR n=1 TO 30: BEEP .01,n:
BEEP .01,n+1: BEEP .01,n+2: BEEP
 .01,n+3: BEEP .01,n+4: NEXT n
7080 PRINT AT 15,1; PAPER 2; INK
 7; FLASH 1;"The Moon Base can n
ow be built"
7500 GO TO 9999
9005 RESTORE 9020
9010 FOR n=1 TO 10: READ a$: FOR
 m=0 TO 7: READ a: POKE USR a$+m
,a: NEXT m: NEXT n
9020 DATA "a",24,60,189,189,255,
189,153,153
9030 DATA "b",195,135,31,63,127,
127,255,255
9040 DATA "c",0,7,24,32,32,64,12
8,128
9050 DATA "d",0,224,24,4,4,2,1,1
9060 DATA "e",1,1,6,4,8,16,224,0
9070 DATA "f",128,128,96,32,16,8
,7,0
9080 DATA "g",128,192,224,240,24
8,252,254,255
9090 DATA "h",1,3,7,15,31,63,127
,255
9100 DATA "i",24,52,52,24,126,24
,36,54
9110 DATA "j",24,24,60,60,126,12
6,255,255
9150 RETURN
9500 REM Instructions
9510 BORDER 1: INK 0: PAPER 7: B
RIGHT 1: CLS
9530 PRINT AT 1,0; INK 1;z$; INK
```



```
 0;''"Your home planet has run o
ut of  minerals and fuels.It is
up to     you to land on the plan
et's   moon and set up a MOON BA
SE to        explore the area."
9535 PRINT ''"However your task
is not as easy"'"as it sounds be
cause the nearest"'"  planet is
 surrounded by an    "'"  asteroi
d belt,is difficult to"'"land on
and is very cratered !!!"
9540 PRINT #1; PAPER 1; INK 7; B
RIGHT 1; FLASH 1;"   Press any K
ey to continue          "
9550 PAUSE 0: CLS
9560 PRINT AT 1,0; INK 1;z$
9570 PRINT "          The obstacles
 are"''"     1/ An Asteriod Field
"'" Dodge the on coming Asteriod
s"''"     2/ Landing at sea"'" La
nd on the drifting platform"''"
   3/The Moons surface"'"     You
are now on land but the"'" surfa
ce is too cratered for the"'"spa
ce ship so you have to search"'"
on foot....Watch out for Craters
"
9575 PRINT AT 21,5;"Use Cursor K
eys to move"
9580 PRINT #1; PAPER 1; INK 7; B
RIGHT 1; FLASH 1;"      Press any
 Key to play          "
9590 PAUSE 0: CLS : RETURN
9998  FOR n=0 TO 21: PRINT AT n,
0; PAPER 7; INK 2; OVER 1;"
                              ": NE
XT n: PRINT AT 0,0; PAPER 6; INK
 0;"    You have failed to comple
te              the Mission
    ": BEEP 1,-20
9999 PAUSE 0: PAUSE 0: PAPER 6:
CLS : PRINT AT 1,0; INK 1;z$: PR
INT AT 15,7; INK 0; FLASH 1;"Ano
ther try (y/n)": PAUSE 0: IF INK
EY$="y" THEN  GO TO 9
```

CLIMBER



CLIMBER was written for the 16K ZX-81 by Piers Pettman of Amersham, Bucks. You are the "X" and have to work your way to the top of the wall by placing yourself beneath the opening on each level. There are 50 skill levels from which to choose and there is also a cheat facility for those who cannot make a successful climb.

```
  1 LET B=100000
  2 SAVE "CLIMBER"
  3 GOSUB 5000
  4 LET B=0
  5 LET B=0
 10 LET TIME=0
 11 LET D=20
 12 LET C=15
 13 CLS
 14 GOSUB 2000
 15 PRINT AT 8,3;"ENTER SKILL L
EVEL(1 TO 50)"
 16 PRINT AT 12,7;"50 IS THE E
ASIEST"
 17 INPUT O(11)
 18 IF O(11)>50 OR O(11)<1 THEN
 GOTO 17
 19 CLS
 20 FOR F=0 TO 20 STEP 2
 21 PRINT AT F,0;"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓"
 23 NEXT F
```

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```
  24 FOR F=1 TO 21 STEP 2
  25 PRINT AT F,0;"[redacted]"
  27 NEXT F
  28 PRINT AT 0,0;"[redacted]"
  40 GOTO 52
  50 PRINT AT D-1,L;"▒"
  52 LET L=INT (RND*27)+2
  53 IF D=2 THEN GOTO 300
  56 PRINT AT D-1,L;"▒"
  57 FOR F=0 TO O(11)
  70 LET C=C-(INKEY$="5" OR D<2)
+(INKEY$="8" OR D>30)
  75 IF INKEY$="7" AND C=L THEN
GOTO 150
  77 PRINT AT D,C;"X";
  82 LET TIME=TIME+1
  85 PRINT AT D,C;"▒"
  87 IF INKEY$="9" THEN GOSUB 17
0
  90 NEXT F
  91 GOTO 50
 150 LET D=D-2
 160 GOTO 50
 170 IF C>L THEN LET C=C-1
 180 IF C<L THEN LET C=C+1
 190 IF C=L THEN GOTO 150
 191 IF D=2 THEN GOTO 300
 193 RETURN
 300 FOR F=0 TO 25
 301 NEXT F
 302 CLS
 303 PRINT "GAME:";G
 304 PRINT
 310 PRINT "YOU FINISHED WITH A
TIME OF ";TIME
 311 LET A(11)=TIME
 320 PRINT
 330 PRINT "ON SKILL LEVEL ";O(1
1)
 349 FAST
 350 PRINT
 351 PRINT "HERE ARE THE TOP TEN
 SCORES"
 352 GOSUB 3000
 353 SLOW
 358 PRINT
 360 PRINT "PRESS ANY KEY"
 365 IF INKEY$<>"" THEN GOTO 365
 370 IF INKEY$="" THEN GOTO 370
 371 LET G=G+1
 375 CLS
 380 GOTO 3
2001 PRINT AT 0,0;"*************
*******************"
2010 LET V$="*
                              **
                              **
                              **
                              **
                              **
                              **
                              **
                              **
                              **
                               *"
2020 PRINT V$
2030 PRINT V$
2040 PRINT AT 21,0;"************
********************"
2050 RETURN
3000 LET V=0
3010 FOR F=1 TO 10
3040 IF A(F)>A(F+1) THEN GOSUB 4
Ø00
3050 NEXT F
3054 IF V=1 THEN GOTO 3000
3055 SLOW
3064 FOR F=1 TO 10
3067 PRINT AT F+6,1;F;AT F+6,4;A
$(F);AT F+6,24;"(";AT F+6,27;")"
;AT F+6,20;
3068 IF A(F)=10000 THEN PRINT "?
??"
3069 IF A(F)<>10000 THEN PRINT A
(F)
3070 PRINT AT F+6,25;O(F)
3079 NEXT F
3080 RETURN
4000 LET X=A(F)
4002 LET W=O(F)
4005 LET X$=A$(F)
4010 LET A(F)=A(F+1)
4012 LET O(F)=O(F+1)
4015 LET A$(F)=A$(F+1)
4020 LET A(F+1)=X
4022 LET O(F+1)=W
4025 LET A$(F+1)=X$
4027 LET V=1
```

```
4030 RETURN
4500 DIM A$(11,20)
4501 DIM A(11)
4502 DIM O(11)
4504 FOR F=1 TO 10
4510 LET A$(F)="????????"
4520 LET A(F)=10000
4530 NEXT F
4535 GOTO 6000
4536 LET G=1
4540 RETURN
5000 IF B=100000 THEN GOSUB 4500
5001  GOSUB 2000
5007 PRINT AT 3,12;" CLIMBER "
5010 PRINT AT 10,5;"PLEASE ENTER YOUR NAME"
5020 INPUT A$(11)
5030 CLS
5040 RETURN
6000 POKE 16441,0
6001 PRINT AT 0,0;"CLIMBER"
6003 PRINT AT 4,0;"INSTRUCTIONS"
6010 PRINT AT 5,0;"    CLIMBER IS A REACTION GAME GUARANTEED TO TEST THE MOST       LIGHTNING-FINGERED OPORATER."
6020 PRINT "YOU MUST MAKE YOUR WAY THROUGH ASERIES OF PARALLEL WALLS IN "
6030 PRINT "WHICH A MAGICAL GATEWAY APPEARS AT RANDOM POSITIONS.";
6040 PRINT "YOU ARE       REPRESENTED ON SCREEN BY X AND  CAN MANOEUVRE YOURSELF    LEFT    AND RIGHT WITH KEYS 5 AND 8"
6050 PRINT "IF YOU ARE QUICK ENOUGH TO      POSITION YORSELF UNDER AN        OPENING THEN YOU MAY PROCEED TO THE NEXT LEVEL BY PRESSING THE  KEY 7."
6070 PRINT AT 21,0;"PRESS ANY KEY"
6080 IF INKEY$="" THEN GOTO 6080
6085  CLS
6090 PRINT "WHEN YOU REACH THE TOP LEVEL      YOUR TIME,THE TOP TEN TIMES AND THE SKILL LEVEL OF THOSE TOP TEN WILL BE DISPLAYED."
6095 PRINT
6100 PRINT "FOR THOSE NOVICES WHO CANNOT      MASTER THE GAME,THERE IS A      CHEATING MECHANISM BUILT INTO    THE PROGRAM.";
6110 PRINT "BY PRESSING THE KEY 9 THE COMPUTER WILL CONTROL THE X FOR YOU."
6111 PRINT
6112 PRINT
6114 PRINT "PRESS ANY KEY"
6115 IF INKEY$<>"" THEN GOTO 6115
6116 IF INKEY$="" THEN GOTO 6116
6117  CLS
6118 GOTO 4536
```



HAUNTED HOUSE



COLLECT the jars from under the chimney and take them back to your van. Lay snares to trap the pursuing ghosts and pick up the hammer which you can use to eliminate the skeleton.

Haunted House was written for the 16K Spectrum by Babar Abidi, aged 13, of London SW19.

```
   4 CLEAR 34999: LET hs=0: LET
 h$="ajm": PRINT AT 10,5; FLASH
 1;" WEE!!..HERE WE GO AGAIN!": G
 O TO 1000
   5 IF ATTR (a+1,b)=6 THEN  PRI
 NT AT a+1,b; INK 4;"m"
  50 PRINT  OVER 1; INK 2; PAPER
  8;AT a,b;"a"
  51 IF a=4 AND b=15 AND h=1 THE
 N  BEEP .1,10: LET t=t+5: IF t>=
 20 THEN  LET t=20: PRINT AT 2,0;
 " ": LET h=0: LET s=s+100: PRINT
  AT 3,15; INK 6;" "
  52 LET a=a+(INKEY$="a" AND ATT
 R (a+1,b)=2)-(INKEY$="q" AND ATT
 R (a-1,b)=2)
  53 IF a=12 AND b=26 AND ATTR (
 a,b+1)=5 THEN  BEEP .1,20: PRINT
  AT 12,27; INK 7;" ": PRINT AT 2
 ,0;"g": LET h=1
  54 LET b=b+(INKEY$="p" AND b<=
 29 AND ATTR (a,b+1)<>6)-(INKEY$=
 "o" AND b>=2 AND ATTR (a,b-1)<>6
 )
  55 PRINT  OVER 1;AT a,b; INK 9
 ;"a"
  56 IF INKEY$=="z" THEN  GO SUB
  5
  57 PRINT AT 0,10-LEN STR$ s; I
 NK 6;s
  59 LET t=t-.015: IF t<=0 THEN
  GO SUB 800
  60 PRINT AT 21,6; INK 6; PAPER
  2;t$( TO t); PAPER 0;" "
  62 PRINT AT c,d; OVER 1; INK 2
 ;"c"
  63 IF ATTR (c+1,d)=4 THEN  POK
 E 35006,5: POKE 35025,28: RANDOM
 IZE USR 35000: PRINT AT c+1,d; I
 NK 5; BRIGHT 1;"n": POKE 35025,2
 9: RANDOMIZE USR 35000: PRINT AT
  c+1,d; INK 6;"f": LET c=4: RAND
 OMIZE : LET d=(RND*10)+1: LET s=
 s+25
  64 LET d=d+(d<=b AND ATTR (c,d
 +1)<>6)-(d>=b)
  65 LET c=c-(c>=a AND ATTR (c-1
 ,d)<>6 AND ATTR (c-1,d)<>4)+(c<=
 a AND ATTR (c+1,d)<>6 AND ATTR (
 c+1,d)<>4)
  69 PRINT  OVER 1;AT c,d; INK 5
 ;"c"
  80 IF a=4 AND b=26 AND g=0 THE
 N  LET j=j-1: LET g=1: PRINT AT
 4,28; INK 7;j$( TO j);" ": BEEP
 .1,50: LET u=1
  85 IF a=19 AND b=3 AND u=1 THE
 N  LET s=s+275: POKE 35056,5: RA
 NDOMIZE USR 35000: LET u=0: LET
 g=0: IF j=0 THEN  GO TO 200
  99 IF a=INT c AND b=INT d THEN
  GO TO 800
 100 GO TO 50
 200 LET s=s+INT (t*50)
 210 PRINT AT a,b;" ";AT c,d;" "
 215 PRINT AT 20,1; BRIGHT 1; FL
 ASH 1;"          B  O  N  U  S
    "
 220 POKE 35006,100: RANDOMIZE U
 SR 35000
 240 LET a=19: LET b=3: LET c=4:
  LET d=26: LET h=h+1: LET j=3
 250 LET t=20-h: IF t<=10 THEN
 LET t=10
 260 PRINT  OVER 1;AT c,d;"c"
 270 PRINT AT 4,28;j$( TO j)
 280 PRINT AT 20,1; FLASH 0;"
                                "
 290 GO TO 51
 800 PRINT AT a,b; OVER 1;"a";AT
  c,d; OVER 1;"c"
 801 PRINT AT 21,27;" "
 810 FOR n=10 TO 2 STEP -2: BEEP
  .1,n: PAUSE 1: NEXT n
 815 PAUSE 7: BEEP .075,8: PAUSE
  1: PRINT AT a,b;"n": BEEP .075,
  8
 820 PRINT AT a,b;" "

 831 LET m=m-1: IF m<=0 THEN  GO
  TO 900
 840 PRINT AT 21,28; INK 4;m$( T
 O m);" "
 850 LET a=19: LET b=3: LET c=4:
  LET d=26: LET g=0: PRINT AT 4,2
 8;j$( TO j)
 860 PRINT AT c,d; OVER 1;"c"
 890 GO TO 51
 900 IF s>=hs THEN  LET hs=s: PR
 INT AT 5,0; INK 7; PAPER 2;"NEW
 HIGH SCORE !! ENTER INITIALS"
 901 IF s=hs THEN  FOR n=-50 TO
 50 STEP 5: BEEP .1,n: NEXT n
 902 IF s=hs THEN  INPUT h$: IF
 LEN h$>3 THEN  GO TO 902
 903 PRINT AT 21,28;" "
 931 PRINT AT 21,27;" ": PRINT A
 T 11,0; INK 6; PAPER 1; FLASH 1;
 "          GAME OVER
    "
 932 PRINT AT 15,0; INK 0; PAPER
  5;"     ANOTHER GAME        Y /
  N  "
 933 IF INKEY$="y" THEN  RESTORE
  9927: GO SUB 9900: GO SUB 9920:
  GO TO 51
 934 IF INKEY$="n" THEN  PRINT U
 SR 0
 940 GO TO 920
1000 GO SUB 9990: REM sound
1010 GO SUB 9900: REM variables
```

```
1020 GO SUB 9800: REM graphics
1030 GO SUB 9700: REM info
1040 GO SUB 9920: REM screen
1050 GO TO 51    : REM the game
9700 BORDER 1: PAPER 1: INK 7: C
LS
9710 LET i$="  Welcome to Haunte
d House......You must travel aro
und the houseto collect the jars
 which are   under the chimney p
ot. When you collect a jar you m
ust take it  back to your van,th
en collect   another jar.
             The spooks you wi
ll find are..  c Ghost
               e Skeleton
             The ghost can be
disposed of by laying a snare an
d the        skeleton by collecti
ng the       hammer and running u
nderneath."
9715 LET i$=i$+"
                           CONTR
OLS                 (Q) UP     (A
) Down              (O) Left   (P
) Right             (Z) Lay a snar
e"
9717 PRINT "   H A U N T E D
H O U S E   "
9718 PRINT "   = = = = = = = =
= = = = =   "
9720 FOR n=1 TO LEN i$: BEEP .00
5,5: PRINT i$(n);: NEXT n
9725 POKE 35004,255: POKE 35006,
50: RANDOMIZE USR 35000
9730 PRINT #0; FLASH 1;"      PRE
SS ANY KEY TO BEGIN       "
9740 PAUSE 0
9750 POKE 35025,29: RANDOMIZE US
R 35000
9760 RETURN

9803 FOR y=65368 TO 65479
9810 READ z: POKE y,z: NEXT y
9820 DATA 56,40,146,124,56,56,40
,108,129,255,129,255,129,255,129
,255
9830 DATA 62,127,73,73,127,127,8
5,85,127,34,65,65,65,65,65,62
9840 DATA 8,93,73,62,8,20,34,34,
247,247,247,0,0,0,0,0
9850 DATA 0,24,56,112,104,4,2,0,
51,51,51,51,51,51,51,51
9860 DATA 0,0,0,0,15,7,7,31,0,0,
0,0,255,254,254,254,39,71,127,12
7,127,255,40,16,254,254,254,254,
254,255,20,8
9870 DATA 129,195,129,195,129,19
5,129,126,0,73,42,0,99,0,42,73

9890 RETURN
9900   LET t=20: LET t$="hhhhhhhh
hhhhhhhhhhhhhhhhhhhh"
9902 LET j=3: LET j$="ddd"
9903 LET a=19: LET b=3: LET c=4:
 LET d=26
9904 LET m$="aaa": LET m=3
9905 LET u=0: LET g=0
9907 LET h=0
9910 LET s=0
9918 RETURN
9920 BORDER 0: PAPER 0: INK 7: C
LS : FOR n=5 TO 17 STEP 2: PRINT
 AT n,0; INK 6;"ffffffffffffffff
ffffffffffffffff": NEXT n
9925 FOR n=1 TO 14: READ y,x: PR
INT AT y,x; INK 2;"b";AT y+1,x;
INK 2;"b";AT y-1,x; INK 2;"b": N
EXT n
9927 DATA 5,6,5,22,7,2,7,17,7,29
,9,15,11,5,11,24,13,3,13,17,15,1
3,15,30,17,7,18,7
9930 FOR n=1 TO 11: READ y,x: DR
AW  INK 6;y,x: NEXT n
9932 DATA 0,144,127,31,1,0,127,-
31,0,-144,-254,0,0,144,127,31,12
6,-32,0,-142,-254,0
9933 PLOT 0,0
9934 PLOT 250,146: FOR n=1 TO 3:
 READ x,y: DRAW  INK 6;x,y: NEXT
 n
9935 DATA 0,8,-18,0,0,-4
9937 PLOT 246,154: FOR n=1 TO 7:
 READ x,y: DRAW  INK 6;x,y: NEXT
 n
9939 DATA 0,3,2,0,-5,10,-4,0,-5,
-10,2,0,0,-3
9940 PRINT AT 18,1; INK 2;"ij";A
T 19,1; INK 2;"kl"
9942 PRINT AT 12,27; INK 5;"g"
9945 PRINT AT 4,28;j$( TO j)
9947 PRINT AT 21,1; INK 7;"TIME
"; INK 6; PAPER 2;t$( TO t); PAP
ER 0;" "; INK 4;m$( TO m)
9949 PRINT AT 21,30;" "
9950 PRINT #0; INK 7;"HAUNTED HO
USE          "
9952 PRINT AT 0,0; INK 4;"1 UP "
; INK 6;"00000";AT 0,21; INK 5;h
$; INK 7;" 00000"
9953 PRINT AT 3,0; OVER 1; INK 6
;"
  "

9954 PRINT AT 4,26; OVER 1; INK
2;"c"

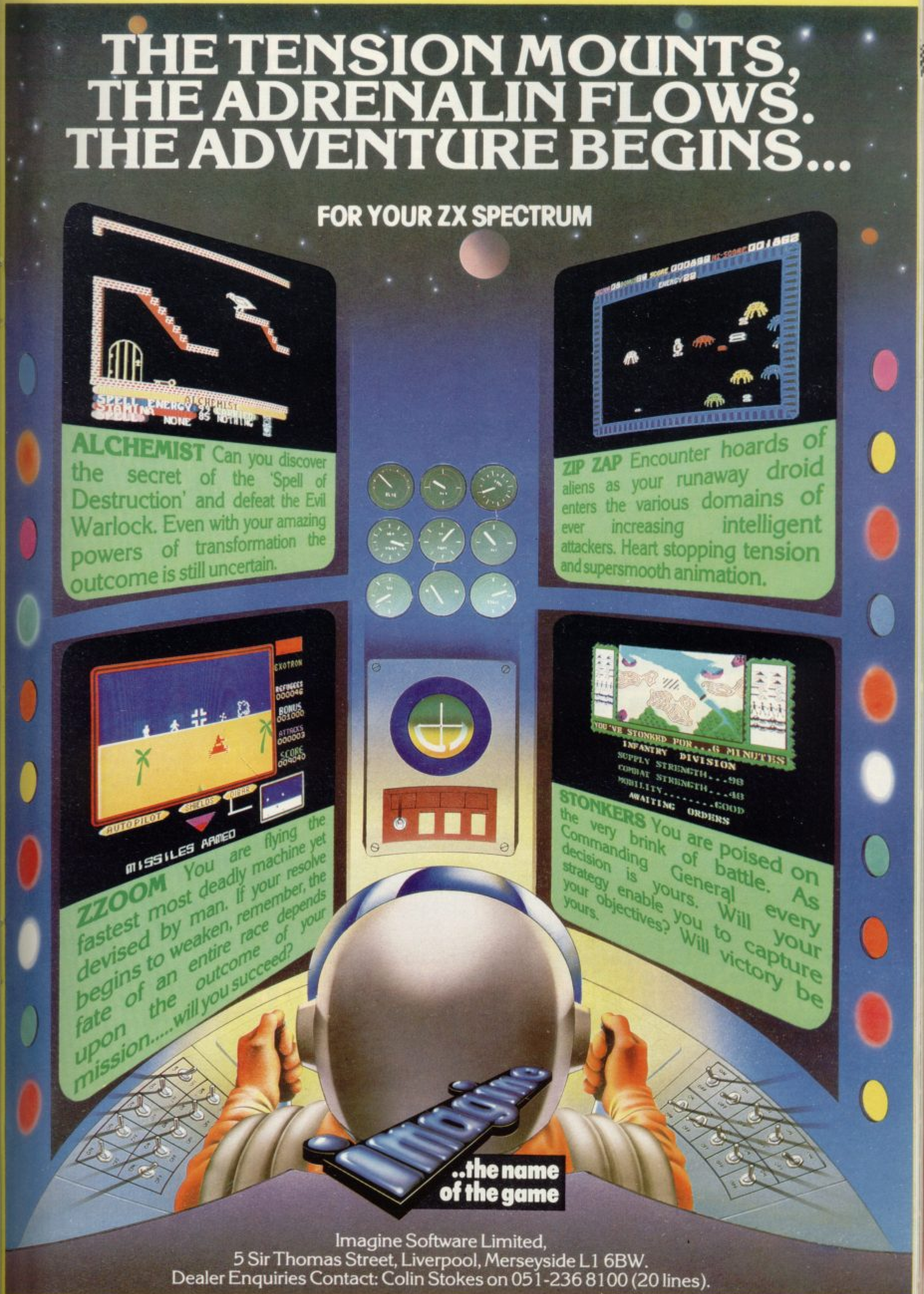
9955 PRINT AT 0,30-LEN STR$ hs;
INK 7;hs
9960 PRINT AT 3,15; INK 6; PAPER
 0;"e"
9970 PRINT ; INK 6;AT 18,6;" ";A
T 18,8; INK 6;" "
9980 RETURN
9990 DEF FN a(n)=(CODE a$(n)-48
AND CODE a$(n)<58)+(CODE a$(n)-5
5 AND CODE a$(n)>64)
9991 LET a$="F31110D0260A3A485C1
F1F1F0EFEEE10ED794310FE2520F41C1
520E8FBC9"
9992 FOR J=1 TO LEN A$ STEP 2
9993 POKE 35000+J/2,16*FN A(J)+F
N A(J+1): NEXT J
9994 RETURN

9995 REM A B C D E F G H I J K
9996 REM A B C D E F G H I J K
9997 REM
9998 REM L M N
9999 REM L M N
```

Bubble Sort

MATTHEW KNIGHT of Sittingbourne, Kent wrote **Bubble Sort** for the 16K ZX-81. It will sort letters or numbers into their correct alphabetical or numerical order. After the last number or letter has been entered the screen will go black while the computer sorts the correct order. Decimal numbers as well as whole numbers can be entered.

```
  10 REM ***BUBBLE SORT***
  20 PRINT AT 10,10;"BUBBLE SORT"
  30 FOR A=1 TO 100
  40 NEXT A
  50 CLS
  51 PRINT AT 10,5;"NUMBERS OR LETTERS"
  52 INPUT A$
  53 CLS
  54 IF A$="LETTERS" THEN GOTO 370
  60 PRINT AT 10,4;"HOW MANY NUMBERS ARE THERE"
  70 INPUT NUMBER
  80 CLS
  90 DIM B(NUMBER)
 100 PRINT AT 10,0;"INPUT EACH NUMBER THEN PRESS N/L"
 110 FOR C=1 TO NUMBER
 120 INPUT B(C)
 130 NEXT C
 140 CLS
 150 FAST
 160 FOR D=1 TO NUMBER
 170 FOR E=1 TO NUMBER-1
 180 LET F=B(E)
 190 LET G=B(E+1)
 200 IF F>G THEN LET B(E)=G
 210 IF F>G THEN LET B(E+1)=F
 220 NEXT E
 230 NEXT D
 240 SLOW
 250 PRINT TAB (7);"THE NUMBERS ARE"
 260 PRINT
 270 FOR H=1 TO NUMBER
 280 PRINT B(H);" ";
 290 NEXT H
 300 IF INKEY$="" THEN GOTO 300
 310 CLS
 320 PRINT AT 10,2;"ARE THERE ANY MORE NUMBERS"
 330 IF INKEY$="" THEN GOTO 330
 340 CLS
 350 IF INKEY$="Y" THEN GOTO 10
 360 IF INKEY$<>"Y" THEN STOP
 370 REM ****SORTING LETTERS****
 380 PRINT AT 10,4;"HOW MANY LETTERS ARE THERE"
 390 INPUT B
 400 CLS
 410 PRINT AT 10,0;"INPUT EACH LETTER THEN PRESS N/L"
 420 DIM Z$(B)
 430 FOR G=1 TO B
 440 INPUT Z$(G)
 450 NEXT G
 460 CLS
 470 FAST
 480 FOR Y=1 TO B
 490 FOR X=1 TO B-1
 500 LET L$=Z$(X)
 510 LET M$=Z$(X+1)
 520 IF CODE M$<CODE L$ THEN LET Z$(X)=M$
 530 IF CODE M$<CODE L$ THEN LET Z$(X+1)=L$
 540 NEXT X
 550 NEXT Y
 560 SLOW
 570 PRINT TAB 7;"THE LETTERS ARE"
 580 PRINT
 590 FOR T=1 TO B
 600 PRINT Z$(T);" ";
 610 NEXT T
 620 IF INKEY$="" THEN GOTO 620
 630 CLS
 640 PRINT AT 10,2;"ARE THERE ANY MORE LETTERS"
 650 IF INKEY$="" THEN GOTO 650
 660 CLS
 670 IF INKEY$="Y" THEN GOTO 10
 680 IF INKEY$<>"Y" THEN STOP
```


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CONSUMABLES TO DATE........

Coffee consumed		1008 Cups
Soft drinks consumed		897 Cans
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	Salad	353½ (Eugene didn't like one of his)

..the name of the game

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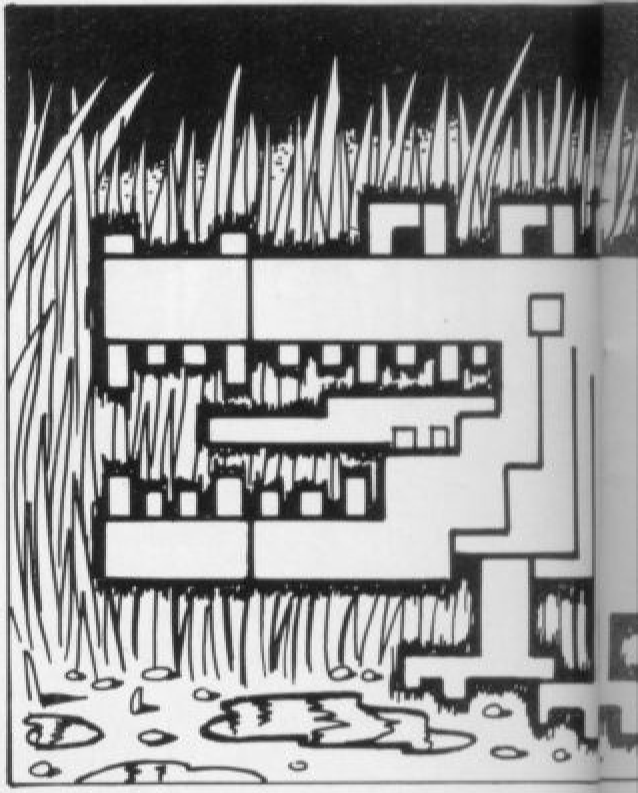
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Slicing an alligator for easy display

John Kerrigan explains how to use machine code to store large graphics figures



THE SPECTRUM manual explains on page 93 how standard user-defined characters can be set up. Each standard character is eight bits — one byte — wide and eight scans high; it is stored as eight bytes, one after the other in memory. Each byte is a complete horizontal slice of the character.

Consider storing a bigger figure in memory. As an example, let the figure be an alligator swimming, shown in figure one. That figure was drawn on graph paper so that I could count the number of boxes contained inside the figure. At its widest points the figure is 57 boxes or bits wide. The greatest vertical distance is 14 boxes or scans high.

With such bigger figures there can be advantages in storing them in vertical slices. That is especially true if we want to show the alligator swimming smoothly on to the screen from the left or right but let us leave that problem until later. For the moment, let us consider a routine which will show the whole of the figure on the screen.

For that routine — S3 shown in box one — we must store the figure in high memory in horizontal slices. Each slice can be contained in eight bytes, or 64 bits, and with 14 such slices we should set aside 112 bytes. The figure is reduced to the numbers defining each byte in lines 80, 90, 100, 110, 120 and 130 of the Basic program shown in box two.

Box 1.

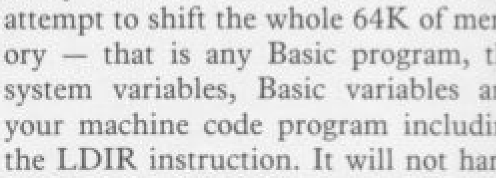
SPECIFICATIONS S3 — ZX Spectrum
GENERAL DESCRIPTION: Shows figure on the screen. The figure must first be loaded into high memory in horizontal slices. There are no checks that the figure will fit on to the screen.
ON ENTRY: V1 (a 2-byte variable at 71F7H and 71F8H) must point to the top left of the position of the figure in screen memory. V2 (a 2-byte variable at 71F9H and 71FAH) must point to the first byte of the figure store in high memory. V3 (a 1-byte variable at 71FBH) must hold the number of bytes per scan (width) in the figure. V4 (a 1-byte variable at 71FCH must hold the number of scans (height) in the figure.
ON EXIT: The figure is displayed. V1, V2 and V4 have their contents destroyed.
USES: A, B, C, D, E, H, L, V1, V2, V3, V4.

```
7200            00100     ORG 7200H
7200 ED5BF771   00110  S3 LD DE,(V1)  ;LOCATION IN SCREEN MEMORY OF
                00120                 ;TOP LEFT OF FIGURE
7204 2AF971     00130     LD HL,(V2)  ;LOCATION (OUT OF SCREEN MEM)
                00140                 ;WHERE FIGURE STORED
7207 ED4BFB71   00150     LD BC,(V3)  ;NO OF BYTES IN FIGURE HELD
                00160                 ;IN C
720B 0600       00170     LD B,0      ;CLEAR V4 (71FC) FROM B
720D EDB0       00180     LDIR
720F 22F971     00190     LD (V2),HL  ;CURRENT PLACE IN FIG STORE
7212 2AF771     00200     LD HL,(V1)  ;LEFTMOST POS OF SCAN JUST
                00210                 ;PRINTED
7215 CD0070     00220     CALL S0     ;DOWN A SCAN
7218 22F771     00230     LD (V1),HL
721B 2AFC71     00240     LD HL,(V4)  ;NO OF SCANS HELD IN L
                00250                 ;NONSENSE IN H
721E 2D         00260     DEC L
721F C8         00270     RET Z       ;RETURN IF ZERO FLAG SET
7220 22FC71     00280     LD (V4),HL  ;STORE SCANS YET TO PRINT
7223 C30072     00290     JP S3       ;BACK TO PRINT NEXT SCAN
71F7            00300  V1 EQU 71F7H
7179            00310  V2 EQU 71F9H
71FB            00320  V3 EQU 71FBH
71FC            00330  V4 EQU 71FCH
7000            00340  S0 EQU 7000H
0000            00350     END
00000 TOTAL ERRORS
```

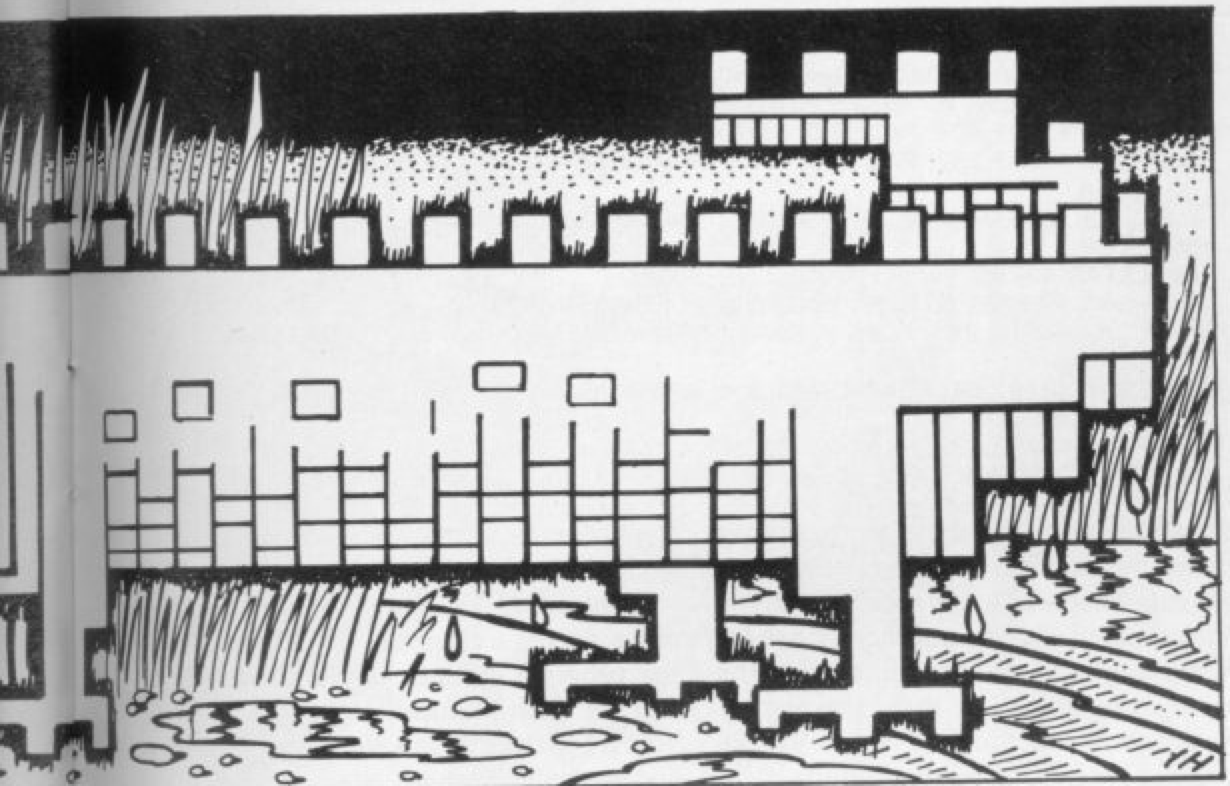
The key to the way in which S3 works is the powerful Z-80 instruction "LDIR". That instruction transfers a byte of data from the address pointed to by the HL register pair to the address pointed to by the DE register pair. Then HL and DE are incremented — increased by one — and the BC register pair is decremented — decreased by one. If BC then equals zero, the instruction is terminated. If BC does not equal zero, the instruction is repeated.

That means the three register pairs — HL, DE and BC — must be loaded with sensible values before LDIR is executed. If BC equals zero before the LDIR instruction, the system will almost certainly crash. That is because LDIR will attempt to shift the whole 64K of memory — that is any Basic program, the system variables, Basic variables and your machine code program including the LDIR instruction. It will not harm the computer but you will probably have to switch off and start again from scratch.

Figure 1.



Box three contains a Basic program for 48K Spectrums only in two parts, both of which use LDIR. Lines 100 and above will create two screen displays,



transfer them to high memory with LDIR and then store the duplicate screens on tape. Lines 10 to 60 enable you to load the duplicate screen from tape and then flash between them by holding down any key other than BREAK.

A much more imaginative screen could be created by changing lines 120 and 140. The PAUSE 0s in lines 30 and 40 could be adapted so that different screens are displayed as you require them in your programs. The program illustrates how fast LDIR can shift memory.

Returning to S3, in boxes one and two we use LDIR to transfer the alligator slice by slice. Since each slice consists of eight bytes, that is the number BC must contain before meeting LDIR. HL will contain the address in high memory where we are storing the figure and DE will contain the address in screen memory where we want the figure shown.

S3 is a routine which can be used to show any figure of any size which can fit on the Spectrum screen. The figure must be stored in high memory and the variables V1, V2, V3 and V4 must be loaded with relevant values before S3 is called.

Also in memory must be the routine S0. If you recorded the Basic program from last month's article, you already have a routine to poke S0 into memory. Load the previous program from tape and type the program in box two from line 70 onwards.

When you have S3 working with the alligator you will almost certainly want to use it to show your figures. Your figures may not be the same size as the alligator. You will have to set V1, V2, V3 and V4 to different values before you enter S3.

The contents of V1, V2 and V3 are loaded into the Z-80 registers in the first three instructions of S3. Let us study box one. Ignore the first "ORG" statement. The first instructions are (A) LD DE,(V1) (B) LD HL,(V2) and (C) LD BC,(V3). We already know that brackets in assembly language mean "contents of" — in other words the instructions will not load straight numbers. Instead they will load the contents of the address as indicated by those numbers. In box one, V1 is used as a label for the number 71F7H. So LD DE,(V1) will load the contents of the address 71F7H. Since DE is a pair of registers, it will load the contents of two addresses; that is, it will load the contents of 71F7H and 71F8H. That instruction has been assembled as "ED5BF771". "ED5B" is the opcode meaning Load DE with the contents of the following address(es). "F771" is the address with the order of the bytes reversed.

The Z-80 chip treats any two-byte number as having the bytes the "wrong way round". The least significant byte (LSB) must come first and then the most significant byte (MSB). So if you want your figure to appear at the top left of the screen (4000H), poke 00 into 71F7H (29175) and 40H (or 64) into 71F8H (or 29176).

The last instruction in address 7223H-7225H — line number 290 — is "JP S3". It has been assembled as "C30072". "C3" is the opcode meaning jump to the following address. "0072" is the address 7200H in the standard Z-80 LSB/MSB format. That instruction is an "absolute" jump. There are also "relative" jumps.

Relative jumps are slower than absolute jumps — they work only over short distances and they are more prone to error. On the other hand, they take only two bytes as opposed to three bytes of memory and should need no re-assembling if the routine is moved up or down in memory.

continued on page 88

Box 2.

```
 10 CLEAR 28671
 20 REM S0 MACHINE CODE
 30 DATA 124,230,7,254,7,202,10,112,36,201,125,230,224,254,224,202
 40 DATA 25,112,17,224,6,167,237,82,201,124,254,87,200,17,32,0,25,201
 50 REM POKE S0 INTO MEMORY
 60 FOR A=28672 TO 28705: READ B: POKE A,B: NEXT A
 70 REM ALLIGATOR FIGURE STORE
 80 DATA 0,12,1,255,0,0,0,0,0,30,7,255,248,0,0,0,0,255,159,255,255,0
 90 DATA 0,0,255,255,255,255,255,255,0,0
100 DATA 255,255,255,255,255,255,128,0,127,255,255,255,255,255
110 DATA
    248,0,255,255,255,255,255,255,255,128,1,255,31,255,255,252,255,0
120 DATA 0,0,28,192,0,78,0,0,0,0,56,96,0,207,0,0,0,0,112,112,0,199
130 DATA
    128,0,0,0,96,112,0,199,128,0,0,0,0,112,0,194,0,0,0,0,0,48,0,0,0,0
140 REM POKE ALLIGATOR FIGURE STORE INTO MEMORY
150 FOR A=28706 to 28817: READ B: POKE A,B: NEXT A
160 REM S3 MACHINE CODE
170 DATA 237,91,247,113,42,249,113,237,75,251,113,6,0,237,176,34,249
180 DATA 113,42,247,113,205,0,112
190 DATA 34,247,113,42,252,113,45,200,34,252,113,195,0,114
200 REM POKE S3 INTO MEMORY
210 FOR A=29184 to 29221: READ B: POKE A,B: NEXT A
220 REM INITIAL VALUES OF V1,V2,V3,V4
230 DATA 10,72,34,112,8,14
240 REM POKE INITIAL VALUES INTO MEMORY
250 FOR A=29175 TO 29180: READ B: POKE A,B: NEXT A
260 CLS: RANDOMIZE USR 29184
```

continued from page 87

Box 3.

```
 10 CLEAR 43295: LOAD "Dupscreen"CODE
 20 FOR a=43296 TO 43315: READ b: POKE a,b: NEXT a
 30 POKE 43297,208: PAUSE 0: RANDOMIZE USR 43302
 40 POKE 43297,232: PAUSE 0: RANDOMIZE USR 43302: GO TO 30
 50 DATA
    0,208,0,64,0,24,42,32,169,237,91,34,169,237,75,36,169,237,176,201
 60 STOP
100 CLEAR 43295
110 FOR a=43296 TO 43315: READ b: POKE a,b: NEXT a
120 FOR n=0 TO 255: POKE n, 88+80*SIN (n/128*PI): PLOT n,80*SQR (n/64):
    NEXT n
130 POKE 43297,64: POKE 43299,208: RANDOMIZE USR 43302
140 CLS: LIST 30
150 POKE 43299,232: RANDOMIZE USR 43302
160 FOR a=1 TO 4: SAVE "Dupscreen"CODE 53248,12288: NEXT a
```

As the name implies, a jump relative is a jump relatively forward or backward from the present position. The code takes two bytes, so a jump forward nine bytes will involve adding 7 to the PC (program counter) register. It would be assembled as 18H 07H.

If the program counter points to 7000H and we wish to move to a routine with its first opcode at 7009H, we could either poke 7000H with C3H, 7001H with 09H and 7002H with 70H (JP 7009H); or poke 7000H with 18H and 7001H with 07H (JR $+7).

It is also possible to move backwards with JRs. That involves using a convention as to which numbers are to be considered positive and which are to be considered negative. If the second byte of a relative jump has the top bit set (=1), it is a jump backwards. If that top bit =0, it is a jump forwards. That means that bit 7 is used as a flag to indicate the sign and only bits 0 to 6 are used for the number.

That limits the range of relative jumps. It means that it is not possible to JR forward more than BIN 1111111 (or 127). That is expressed more usually as a limit of 129 bytes because the code moves the program counter forward two bytes. Negative numbers are held in a rather mechanical way. It is similar to the cog wheels of a car speedometer. If one collected a car from a factory, where the mileage was set to nil, and drove the car in reverse for one mile, the display would show that you had driven 99,999 miles. So it is with relative jumps backwards.

The opcode 18H followed by FFH — or BIN 11111111 — will be read as an instruction to take one off the program counter. That will result in the program counter pointing to FFH and treating that as the next opcode.

The opcode 18H followed by FEH — or BIN 11111110 — is an infinite loop. It would instruct the Z-80 to take 2 off the program counter and so read itself again and again and again.

Continuing backwards, we reach more useful examples. Let us assume the program counter points to 900AH and we wish to move to 9000H. Poke 900AH with 18H and 900BH with F4H and we will get there.

Next month's article includes an illustration of a particularly useful relative jump instruction. Also included are routines to make the alligator or any other figure "swim" one pixel left or one pixel right.

● *John Kerrigan runs courses in Z-80 assembly language. Details from Alligator Data Ltd, 01-674 8512.*

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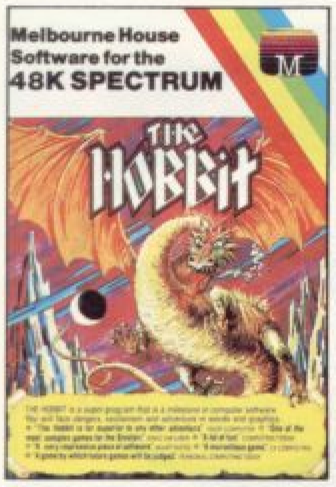


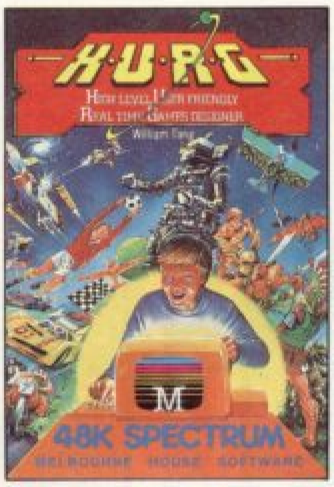
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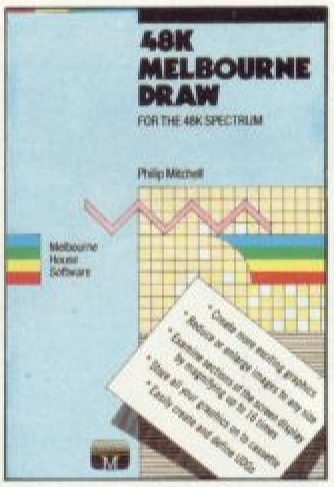
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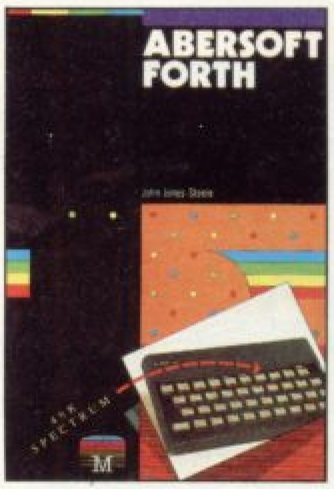
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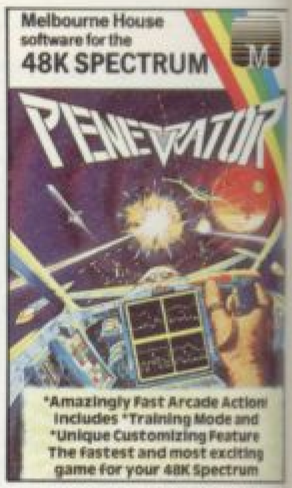












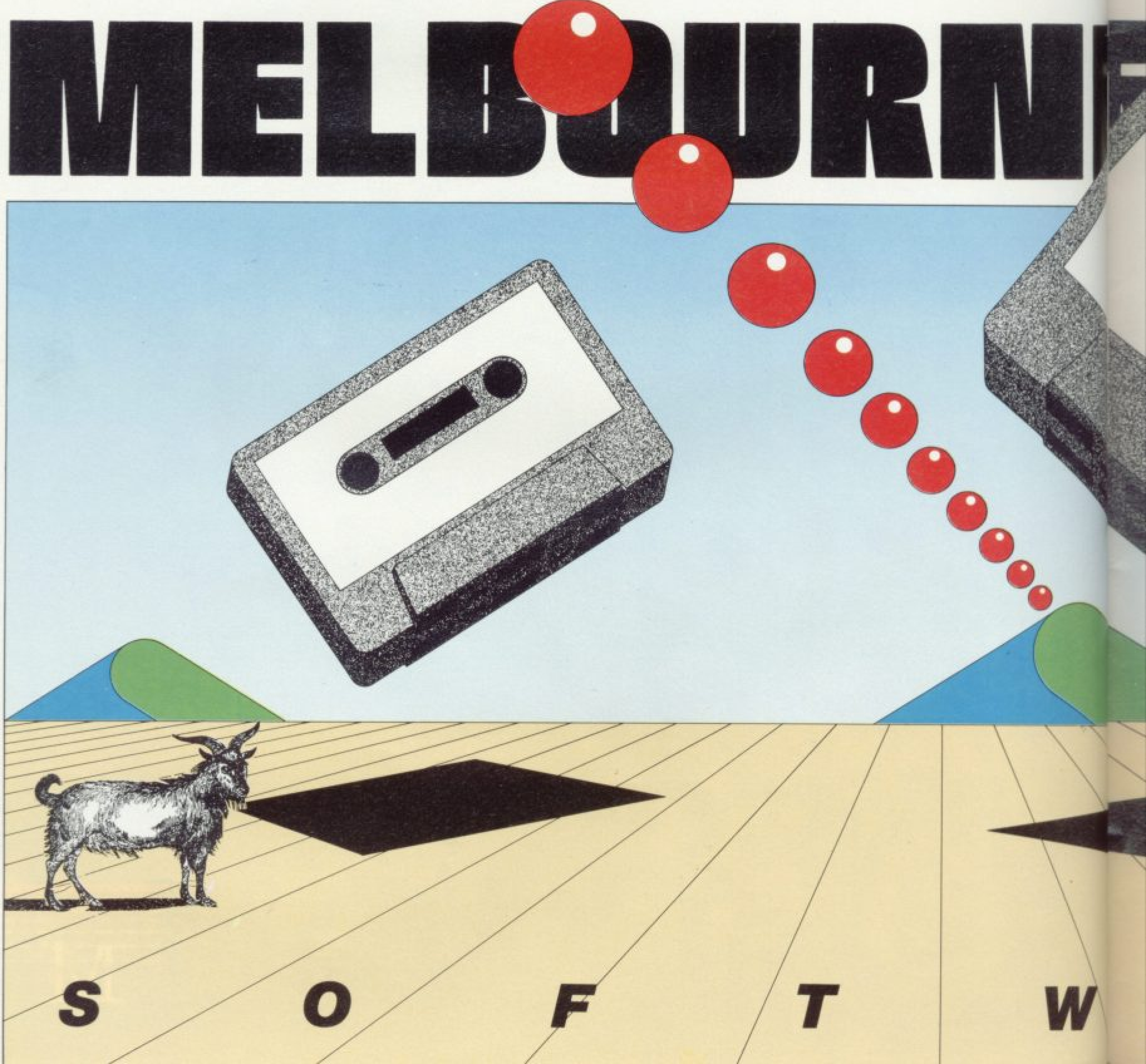
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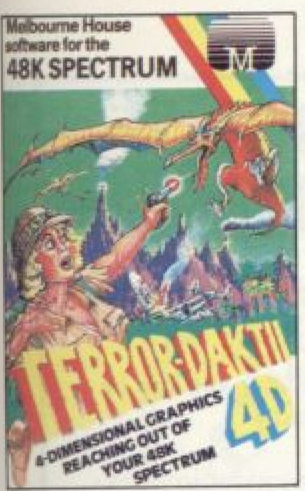
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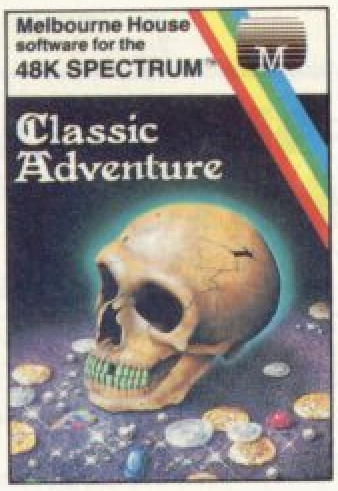
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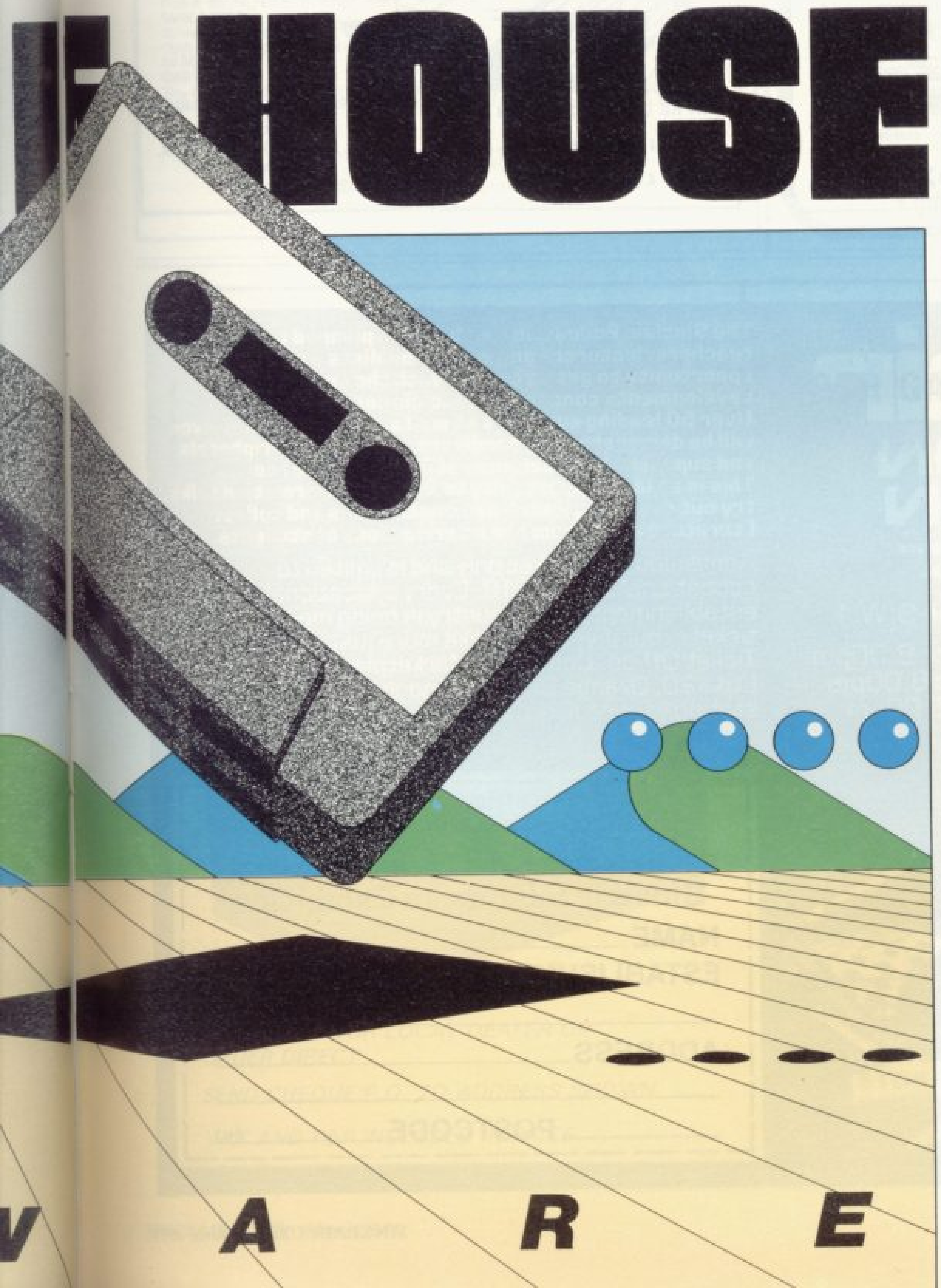
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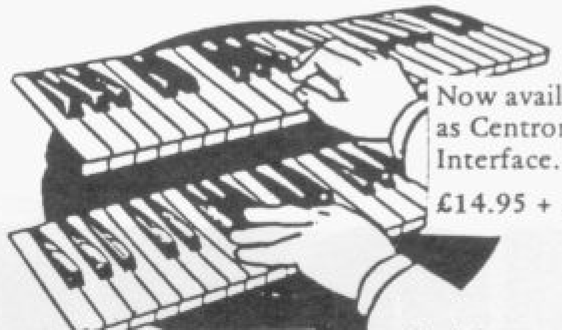
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On probation

Colin Berg puts the Spectrum to work helping offenders in the Cheshire area



WHEN Colin Berg, senior probation officer for south-east Cheshire, wants to know how often the courts are following the recommendations made by his team, or how much time its members are spending on each aspect of their work, he looks it up on his Spectrum. He also uses Spectrums in his work as training officer for the whole Cheshire area and is looking into the ways they can help him educate not only his children but some of the offenders in his care.

Berg's campaign for the computerisation of probation work began when he first saw an advertisement for the newly-released ZX-81. Pleased with the idea of a computer for less than £100, he sent for one immediately. The day it arrived, his wife and children happened to be away and before he knew where he was, he had worked his way through nine chapters of the manual.

The programs he wrote for the ZX-81 formed the basis for those he uses today. When the Spectrum appeared, he promptly ordered the new machine, adapting his old programs to run on it.

The program of which Berg makes the most use is one which correlates all the facts about the offenders in the Congleton area for which he is responsible. Based on the Campbell Systems Masterfile, the program records the age, sex, previous convictions and offence of each client, before which court he or she is appearing, whether the probation officer recommended probation, and what sentence was imposed.

"The program allows us not only to make statistical analyses of what is going on in our area but also to monitor how effectively we are working as probation officers," Berg explains: "If the courts are not following our recommendations in most cases, that means our reports are not good enough. On the other hand, if, say, they are following those of any particular officer too often, that might mean that he is predicting how the court will react, instead of trying to influence its decision."

Berg's program also uncovered another unexpected fact. "We found that whereas most officers tend to recommend probation for about one in 15 men, the figure was more like six out of seven for women," he says. "Further, whereas on average the courts grant probation when we ask for it for men about 70 percent of the time, they were granting it every time in the case of women."

Things really took off for Berg and his Spectrum in 1982 when he organised a management conference and decided to devote an afternoon to the use of computers. "I had several borrowed computers set up for people to experiment with and intended to begin by demonstrating Masterfile to show how it could replace index cards. But there was much hostility to overcome".

Asked to record their views on computers at the start of the session, the 20 or so probation officers attending filled a foolscap sheet of paper with phrases like "more trouble than they're worth, business toys, a threat to confidentiality", and more in the same vein.

By the end of the afternoon, however, they had all changed their minds. "When one of them asked me how many 16-year-olds in Congleton had had three previous convictions, I was able to supply the answer in a few seconds", says Berg.

He performed the same miracle a few minutes later when someone wanted to know the average number of previous convictions on his case-load. "Masterfile is a very good program which, as it happens, can supply averages at the touch of one key. Everyone was duly staggered, especially as it would have taken two days to supply that fact without the computer."

> 'The aim is to force people to clarify their thoughts'

Armed with the favourable reactions he had forced from his audience, Berg visited his chief probation officer and asked for £800 with which to buy four Spectrums. His evidence was so impressive that he was given £1,000, which paid for four Spectrums, four black-and-white TV sets, four tape recorders and two ZX printers. He now runs regular workshops to introduce the use of computers in probation work.

Besides using the Spectrum to analyse and monitor results, Berg has been looking at ways in which it can improve the performance of individual officers. One program, adapted from a commercial decision-making tape, is designed to help officers make up their minds on whether to recommend probation in any particular case.

"The program asks them to enter all the facts which might be relevant, such as family background, recent release from jail, whether it is a serious or petty offence, previous convictions, and so on", Berg explains. "They then have to allot scores to each of those factors according to importance. The aim is to force people to clarify their thoughts and make an informed decision."

One officer who used the program recently commented that his final verdict must be correct, since the computer had produced it. "I had to point out that the decision was his, not that of the computer", says Berg.

Berg has also written two management development programs for use on training courses. One is based on the Kolb method of classifying learning patterns and the other on Dr Meredith Belbin's theories on teams and the roles of individuals within them. "Using the program, we have members of a team analyse their functions within it and then other people's. It can be a painfully revealing process but is often helpful in making the team function better", Berg explains.

Part of a probation officer's work is to supervise and provide support for probationers and Berg's main interest at the moment is using the Spectrum to work directly with the client. "Many of the people in our care are illiterate and innumerate and I think there is plenty of scope for computers in remedial education", he says. "They are especially useful for anyone who has difficulty



relating to other people."

Besides his own programs — a complicated maths game, a spelling game and the football/multiplications table game printed below — Berg thinks that commercially-produced tapes can be helpful in teaching certain simple skills. He tests them on his three children, aged 11, nine and five, and has found the Hornby Software golfing game, Troon, useful for teaching angles and scale.

"If you wrote a program which tried specifically to teach people about angles, no-one would want to know", he says. He thinks the Train Game, from Microsphere, is useful for teaching the layout of a computer keyboard as well as forward planning, and is toying with the idea of using Gangster, a strategy game from CCS, as a way of teaching simple calculations and organisation.

"I think it would have instant appeal to some of my clients", he says.

Berg spends an average of 10 hours a week with his computer — "more if I get carried away", he says. He reckons that it takes him about an evening to write a program and many more evenings to tinker with it until he is satisfied. He thinks his interest in computers is linked to a taste for maths which he never really developed.

Born and raised at Barry, South Wales, Berg went to the local grammar school where he planned to do a degree in music, maths and science. "We were not allowed to mix science and arts subjects, so I took a degree at Swansea University in music, English and economics." He followed it with a course in sociology and entered the probation service in 1971.

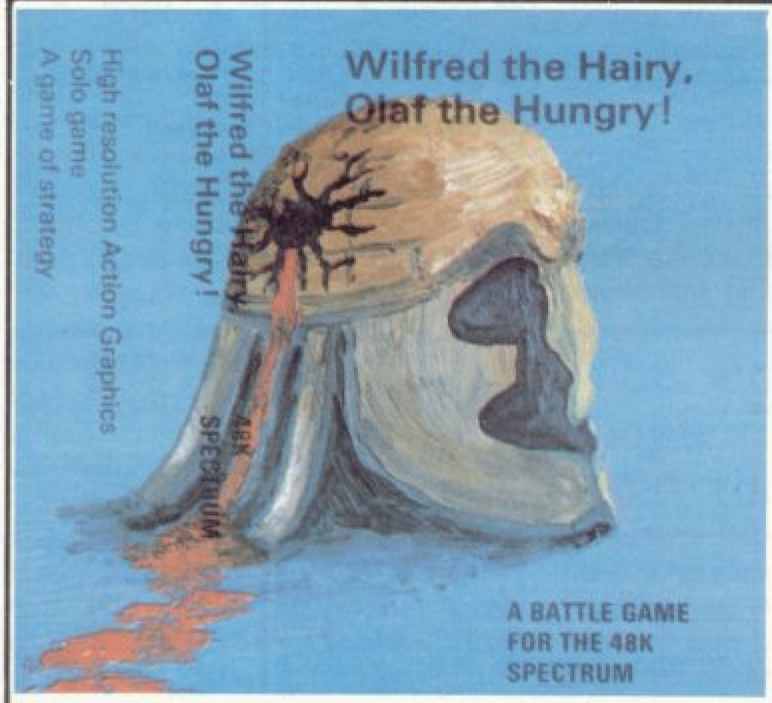
Berg has no regrets about his chosen career and has kept music — or more precisely, the French horn — as his hobby, along with model railways and preaching occasionally in the local Baptist church. The Spectrum still occupies most of his leisure time and he is entirely happy with its performance. Although he has received a mail order form for the Microdrive, for the moment he is biding his time. "Every time I have rushed to buy a Sinclair product, the price has fallen shortly afterwards", he says. "This time I think I shall wait and see."

```
  10 REM FOOTBALL TABLES     C J
Berg
  20 REM SET UP
  22 RANDOMIZE
  25 DIM b$(6,2): DIM m$(2)
  30 LET t$="Football Tables": G
O SUB 1000
  40 BORDER 2: PAPER 6: INK 1: C
LS
  50 PRINT  PAPER 1; INK 7;AT 11
,0;"Before you start do you want
 to run through your tables?
    "
  60 PRINT #1;AT 1,10;"Press Y o
r N"
  70 IF INKEY$="y" THEN  GO TO 9
5
  80 IF INKEY$="n" THEN  GO TO 2
00
  90 GO TO 70
  95 LET a=12
 100 FOR t=2 TO n
 110 GO SUB 1400
 120 NEXT t
 190 REM START GAME
 200 LET tu=0
 210 POKE 23673,0: POKE 23672,0
 215 LET g=0
 220 FOR k=1 TO 20
 225 LET sc=0
 230 GO SUB 1500
 240 LET a=INT (RND*12)+1: LET t
=INT (RND*(n-1))+2
 250 PAPER 7: INK 0: BRIGHT 1
 260 PRINT AT 9,8;a;" x ";t;" =
";
 265 BEEP .5,19
 270 INPUT "Type answer and Pres
s ENTER ";b: PRINT b
 280 BRIGHT 0
 290 IF b=a*t THEN  LET sc=1
 300 PAPER 4: INK 0
 310 PRINT AT 18,0;" "
 320 FOR x=1 TO 4
 330 FOR y=1 TO 2
 340 PRINT AT 18,x;m$(y)
 350 BEEP .1,1+y/2
 360 NEXT y
 370 PRINT AT 18,x;" "
 380 NEXT x
 390 PRINT AT 18,4;m$(2): LET r=
4
 400 FOR z=18 TO 16 STEP -1
 410 FOR x=1 TO 6
 420 FOR y=1 TO 2
 430 PRINT AT z,r+x;b$(x,y)
 440 BEEP .01,(r+x)/10
 450 NEXT y
 460 PRINT AT z,r+x;" "
 470 NEXT x
 480 LET r=r+6
 490 NEXT z
 500 LET r=23
 510 FOR x=1 TO 5 STEP 2
 520 FOR y=1 TO 2
 530 PRINT AT 15,r;b$(x,y)
 540 BEEP .01,r
 550 NEXT y
 560 PRINT AT 15,r;" "
 570 LET r=r+1
 580 NEXT x
 585 LET tu=tu+1.5
 590 IF sc THEN  GO TO 700
 600 PRINT AT 15,27;" ";AT 15,26
;"O"
 610 PRINT  FLASH 1;AT 17,22;"RU
BBISH"
 620 GO SUB 1700
 630 GO SUB 1400
 640 GO TO 760
 700 FOR y=1 TO 2
 710 PRINT AT 14,26;b$(1,y)
 720 BEEP .03,-2
 730 NEXT y
 740 PRINT  FLASH 1;AT 17,23;"GO
AL!": LET g=g+1
 745 PRINT  PAPER 7; INK 1; FLAS
H 1;AT 3,7;g
 750 GO SUB 1800
 760 LET v=(PEEK 23672+256*PEEK
23673)/50+tu
 770 IF v>600 THEN  GO TO 900
 780 NEXT k
 785 REM END OF GAME
 790 BORDER 4: PAPER 7: INK 1: C
LS
 800 PRINT AT 1,8;t$
 810 PRINT  INVERSE 1;AT 4,1;"EN
D OF GAME"
 820 LET h=INT (v/60)
 830 LET j=INT (v-(h*60))
 840 PRINT AT 8,0;"You took ";h;
" minutes and ";j;"seconds to ta
ke your 20 kicks."
 850 PRINT AT 12,0;"And you scor
ed ";g;" goals."
 860 IF g>17 THEN  PRINT AT 15,1
0;"Well Done": GO TO 885
 870 IF g>14 THEN  PRINT AT 15,1
0;"Not Bad": GO TO 885
 880 PRINT AT 15,10;"Try Again"
 885 GO SUB 1800
 886 GO SUB 1900
 890 PRINT AT 20,5;"Press A to t
ry again"
 895 IF INKEY$<>"a" THEN  GO TO
895
 896 PRINT AT 20,0;e$: GO SUB 10
60: GO TO 200
 900 BORDER 2: PAPER 6: INK 0: C
LS
 910 PRINT AT 1,8;t$
 920 PRINT  FLASH 1;AT 4,6;"TIME
 UP - End of Game"
 930 PRINT AT 8,0;"You had ";k;"
 kicks"
 940 GO TO 850
1000 REM Instructions and graphi
cs
1010 BORDER 1: PAPER 7: INK 0: C
LS : POKE 23609,50
1020 PRINT AT 1,8;t$
1030 PRINT AT 4,0;"This is a pen
alty shoot-out gameof football.
You have either 20 kicks or 10 m
inutes to score as many goals as
 you can."
1040 PRINT : PRINT "To have a sh
ot at goal you have to answer a
simple sum based on your times t
ables. If your       answer is co
rrect, you score a  goal, but if
 its wrong the goal-keeper makes
 a save."
1050 GO SUB 1100
1060 PRINT AT 18,0;"  You can ch
oose the tables on     which you
are to be tested."
1070 INPUT "What is the highest
number of   tables that you know
? ";n
1080 IF n>12 THEN  PRINT #1;AT 1
,0;"Sorry, you can only go up to
 12": BEEP 1,9: BEEP 1,-3: GO TO
 1070
1090 RETURN
1100 REM Graphics
1110 LET c$="
            "
1120 RESTURE 1130
1130 DATA ".",0,0,0,0,0,22,112,3
```

continued on page 98

continued from page 97

```
2
1140 DATA " .",0,0,0,0,0,2,7,2
1150 DATA ". ",0,0,0,0,32,112,32,
0
1160 DATA " .",0,0,0,0,2,7,2,0
1170 DATA "E",0,0,0,32,112,32,0,
0
1180 DATA "F",0,0,0,2,7,2,0,0
1190 DATA "G",0,0,32,112,32,0,0,
0
1200 DATA "H",0,0,2,7,2,0,0,0
1210 DATA "I",0,32,112,32,0,0,0,
0
1220 DATA "J",0,2,7,2,0,0,0,0
1230 DATA "K",32,112,32,0,0,0,0,
0
1240 DATA "L",2,7,2,0,0,0,0,0
1250 DATA "M",32,112,32,248,32,3
2,80,144
1260 DATA "N",4,14,4,14,21,4,10,
9
1270 DATA "O",0,80,255,84,35,0,0
,0
1300 FOR u=1 TO 15
1310 READ w$: FOR f=0 TO 7: READ
 D: POKE USR w$+f,D: NEXT f
1320 BEEP .05,10+u/2
1330 NEXT u
1340 LET z=0
1350 FOR x=1 TO 6
1360 FOR y=1 TO 2
1370 LET b$(x,y)=CHR$ (144+z)
1380 LET z=z+1
1382 NEXT y
1384 NEXT x
1386 LET m$(1)="M": LET m$(2)="N
"
1390 RETURN
1400 REM Print Tables
1410 BORDER 3: PAPER 7: CLS
1420 PRINT AT 2,10;t;" TIMES TAB
LE"
1430 FOR p=1 TO a
1440 PRINT AT 4+p,8;p;" x ";t;"
= ";p*t
1450 BEEP .8,p: BEEP .6,p: BEEP
.2,p: BEEP .8,p
1460 NEXT p
1470 PRINT #1;AT 1,8;"Press M to
 go on"
1480 IF INKEY$<>"m" THEN  GO TO
1480
1490 RETURN
1500 REM Draw screen
1510 BORDER 1: PAPER 7: INK 1: C
LS
1520 PRINT AT 1,8;t$
1530 PRINT AT 3,1;"Goals";AT 3,7
; BRIGHT 1;g
1540 PRINT AT 3,23;"Kicks";AT 3,
29; BRIGHT 1;k
1550 PRINT AT 6,1;"Answer this t
o score a goal"
1560 PLOT 56,112: DRAW 120,0: DR
AW 0,-24: DRAW -120,0: DRAW 0,24
1570 PRINT  BRIGHT 1;AT 9,8;e$( 1
 TO 13)
1580 PLOT 0,82: DRAW   255,0
1585 PLOT 0,80: DRAW 255,0
1590 PAPER 4: INK 0
1600 FOR q=12 TO 21: PRINT AT q,
0;e$: NEXT q
1610 PRINT AT 18,0;m$(2);AT 18,5
;b$(1,1)
1615 INK 7: PLOT 134,78: DRAW 72
,-22: PLOT 226,48: DRAW 28,-10:
INK 0
1620 PLOT 204,56: DRAW 0,14: DRA
W 24,-8: DRAW 0,-14
1625 PRINT AT 13,5;"N";AT 14,3;"
M";AT 16,2;"M";AT 19,3;"N";AT 21
,4;"M"
1630 PRINT AT 15,27;m$(1)
1640 RETURN
1700 REM Rubbish tune
1710 FOR o=1 TO 3
1720 BEEP .75,7: BEEP .25,5: BEE
P .75,7: BEEP .25,5: BEEP .5,7:
BEEP .5,4
1725 LET tu=tu+9
1730 PAUSE 20
1740 NEXT o
1750 RETURN
1800 REM Match of Day
1810 LET h=.2
1820 BEEP h,2: BEEP h,7: BEEP h,
11: BEEP h*1.5,14: BEEP h/2,11:
BEEP h,11: BEEP h,11
1830 BEEP h,11: BEEP h*2,11: BEE
P h,12: BEEP h*1.5,14: BEEP h/2,
11: BEEP h,9: BEEP h,11
1840 BEEP h,12: BEEP h,2: BEEP h
,6: BEEP h,9
1850 BEEP h*1.5,12: BEEP h/2,9:
BEEP h,9: BEEP h,9
1860 BEEP h,9: BEEP h*2,9: BEEP
h,11
1870 BEEP h*1.5,12: BEEP h/2,9:
BEEP h,7: BEEP h,9: BEEP h*3,11
1880 LET tu=tu+7
1890 RETURN
1900 REM End of tune
1910 BEEP h,2: BEEP h,7: BEEP h,
11: BEEP h*1.5,14: BEEP h/2,11:
BEEP h,11: BEEP h,11
1920 BEEP h,11: BEEP h*2,11: BEE
P h,12: BEEP h*1.5,14: BEEP h/2,
11: BEEP h,12: BEEP h,14
1930 BEEP h*2,16: BEEP h,16: BEE
P h,18: BEEP h,19: BEEP h/2,19:
BEEP h,18: BEEP h/2,18: BEEP h,1
6
1940 BEEP h,19: BEEP h,14: BEEP
h,14: BEEP h,16: BEEP h,14: BEEP
 h/2,12: BEEP h,11: BEEP h/2,11:
 BEEP h,9
1950 BEEP h*4,7
1960 RETURN
```

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John Gilbert investigates some of the latest computer and programming publications

Probing the puzzles in the bookcase

IF YOU have recovered from the excitement of a computer for a Christmas present and feel you have exploited it to the full, you may like to solve a crime or two using it.

Input an Investigation, by Lois and Floyd McCoy, provides a series of classic mysteries featuring those American computer whizz-kids, the Bytes Brothers, pictured below.

Those brain boxes work their way through five mysteries and always get the correct solution using their home computer called Nibble.

As with any good detective story all the clues for the solution have been incorporated in the plot. The computer programs used to solve the crimes are also included, along with a full explanation on their structure and creation.

The book is for children but adults will be equally enthralled. It provides excellent entertainment and value for money. The good news is that the authors are writing a series of these entertaining books and the second, *Program a Problem,* is on the way. *Input an Investigation* can be obtained from Fontana Armada originals for £1.25.

Continuing with the entertainment theme, Pan Books, in association with *Personal Computer News,* has produced a book of *Micro Puzzles.* Most of the questions set in the book can be solved using your computer.

Micro Puzzles is split into three sections, each of which has a different type of conundrum. The first section is made up of three prize problems. They are very complex and if you can solve all three you can enter a competition to win an ACT Apricot computer.

The next section contains some quickies which could be solved without the aid of a computer. Most of the puzzles require logical thought but some are included for a joke.

The final section is called Micro-puzzles and includes some very tough quizzes. You will need your microcomputer for most of them, although the main problem will be trying to find a program to produce the solutions.

Much thought has gone into the production of *Micro Puzzles* and the result is a challenge to your ability to solve problems in programs. The book costs £2.95.

A mixture of congratulations and criticism goes to Penguin for its publication of *The Penguin Computing Book,* by Susan Curran and Ray Curnow.

Congratulations are due because the company has managed to publish a book which contains a step-by-step guide to computers and electronics. The criticism is that there is nothing new in the format, although the authors have tried to provide a simple and concise explanation of almost everything relating to digital electronics, analogue electronics and computers.

Reading the book it appears that the authors have tried to cram too much information into a small space. Any difficulty in following arguments will not be because of any complexity in the text but because so much information is covered in a few pages.



The structure of the book suggests that it should be read from cover to cover, like *War and Peace,* but it serves better as a handbook to be dipped into when necessary. The index is just adequate for such a purpose. The glossary and bibliography are also useful. The book costs £5.95.

On a slightly simpler level, *Using Your Home Computer* by Garth Davies provides a series of software projects for the owner of any microcomputer. Only brief details of the example projects are given, there are no Basic programs to type-in, and the computer owner is left to do the difficult research.

That may sound like hard work but the author is trying to make the reader think about writing software. Part of the book explains system design and provides examples of computer applications. It shows how to work through a project, from the initial ideas to the rough design and, finally, the coding.

The sample projects include an address book, diary and family tree. All of them involve producing databases with similar structures and the author talks in some detail about the techniques which can be used.

It is a delight to see such a book on the market. It costs £3.50 and can be obtained from Macmillan Press.

One for the beginner is *Machine Code for Beginners,* from Usbourne Books. The title may deter you and you may think it is just another machine code book but it is the easiest book on the subject on the market. Using it, a child at junior school could learn the basic techniques of both Z-80 and 6502 programming. The way the subject is tackled is nothing short of brilliant. That both major types of microchip are covered is an extra bonus.

The cartoon characters, such as robots and bugs, which are included teach machine code in a subtle manner. It is possible to read the book as a comic strip, taking little account of the main text and still derive a knowledge of assembly and machine language. It is reasonably priced at £1.99.

Still staying with children but moving into secondary education, Shiva has produced *Spectrum in Education,* by Eric Deeson. The book is part of its friendly micro series and endeavours to show how a computer can be programmed and for what it can be used.

The structure of the book shows that Deeson is a teacher. It has been carefully produced and structured in such a manner that the reader is unlikely to lose his way reading through the sections on general usage to drawing bar charts, discussing computer-aided design and producting high-resolution graphics. It costs £6.50.

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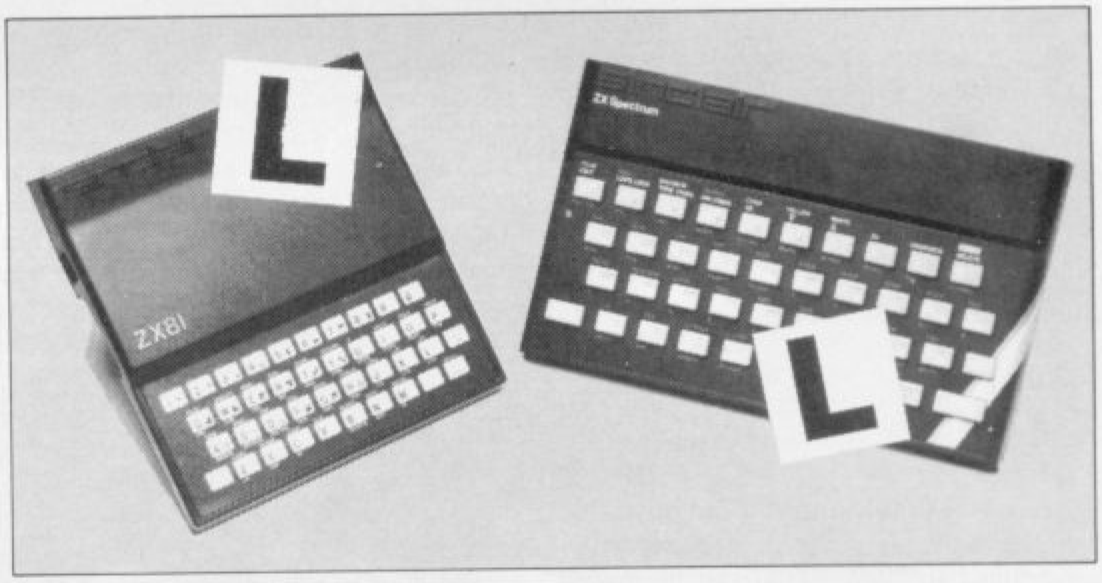
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 102

continued from page 101

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

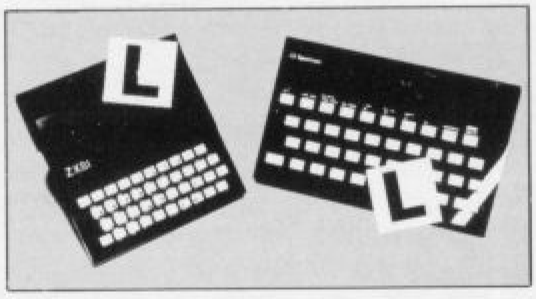
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

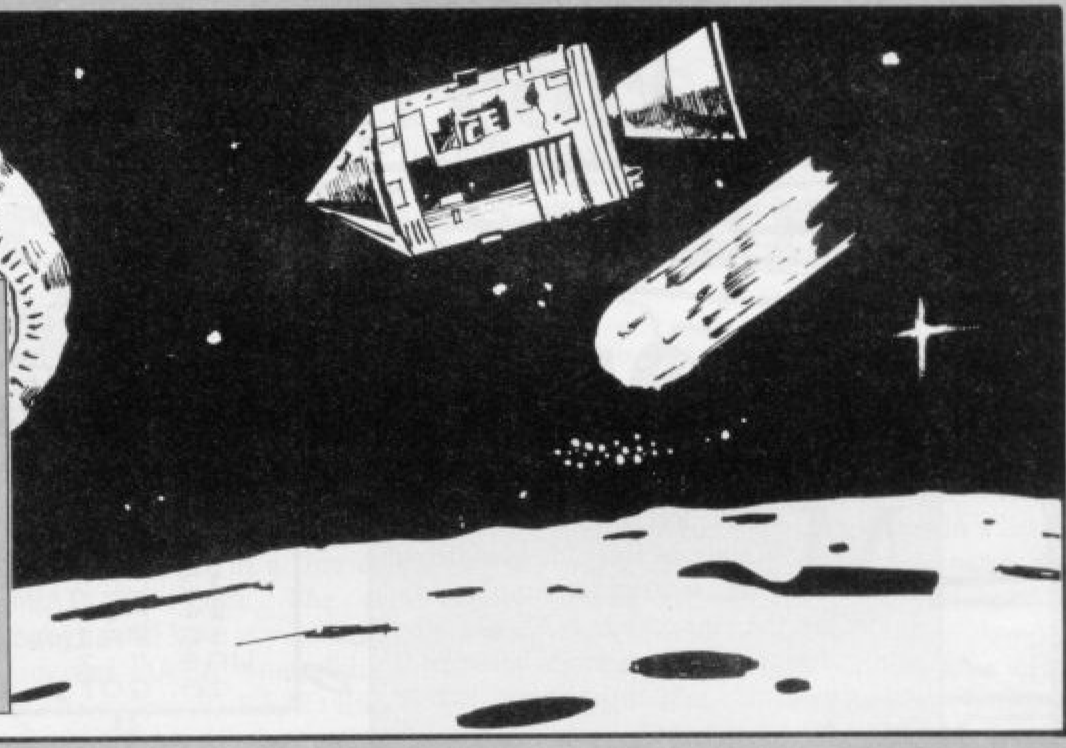
Banana Game



THE BANANA GAME was written for the 1K ZX-81 by Stuart Moore of Milton Keynes, Bucks. Using the cursor keys you have to move your basket round the screen, collecting the bananas before they rot.

```
   1 PRINT "HOW MANY BANANAS ?"
   2 INPUT BAN
   5 LET S=0
  10 LET A$="(▓▒"
  20 LET X=PI-PI
  30 LET Y=PI-PI
  35 FOR L=1 TO BAN
  40 LET BX=INT (RND*15)
  50 LET BY=INT (RND*15)
  60 FOR B=1 TO 3
  70 FOR F=1 TO 10
  80 CLS
  90 PRINT AT X,Y;"O";AT BX,BY;A
$(B)
 100 LET X=X+(INKEY$="6" AND X<V
AL "15")-(INKEY$="7" AND X>PI-PI
)
 110 LET Y=Y+(INKEY$="8" AND Y<V
AL "15")-(INKEY$="5" AND Y>PI-PI
)
 120 IF X=BX AND Y=BY THEN LET S
=S+(4-B)
 125 IF X=BX AND Y=BY THEN GOTO
150
 130 NEXT F
 140 NEXT B
 150 NEXT L
 160 PRINT AT 0,0;"YOU SCORED ";
S;" OUT OF ";BAN*INT PI
```

COSMIC MISSION

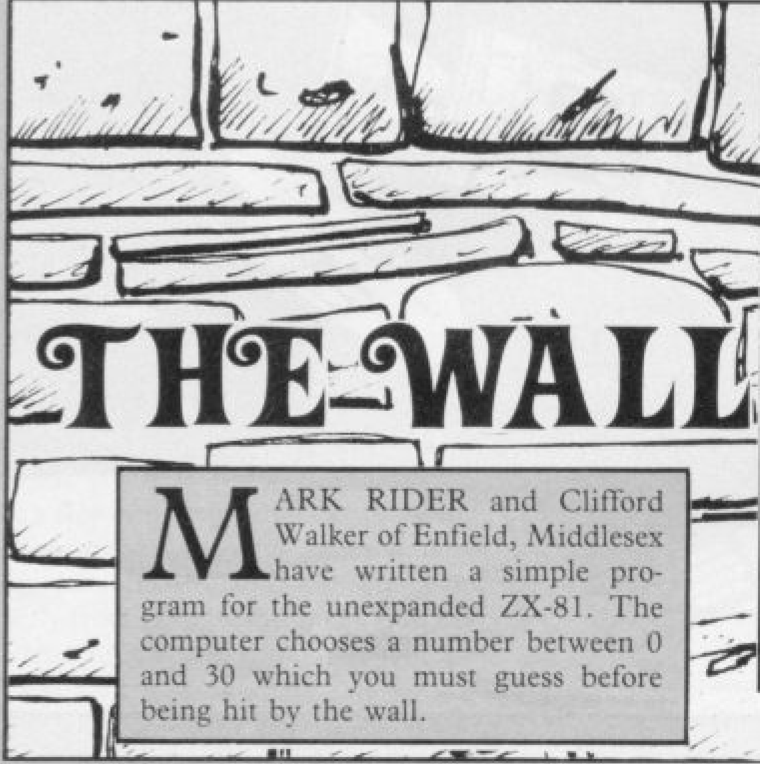


T. SIMMONS of Downham Market, Norfolk wrote **Cosmic Mission** for the 1K ZX-81. Guide your craft through outer space using keys 5 and 8. If you bump into the enemy your force field will disappear and you will be spotted. The score will be given and you can then run the program again. The explanation of the program lines and an adaption for the Spectrum is given below.

100 Defines the Enemy
105 Sets the score to zero for start of game
110-125 These variables are used later in the game and are set to zero initially (see lines 215-250)
130 The amount you score is increased each go. Initially it is set to 1
135 The starting position of your craft across the screen
160-300 This series of lines controls the movements in the game. The program will loop around these lines until the conditions in line 270 have been met.
160 Chooses a random position across the screen for the enemy between 0 and 26
170 Prints the enemy at the bottom of the screen
180-190 Scrolls the whole screen up by one line
200 Each time the program passes this point in the loop your score is increased by the value of t
210 If you have scored 104 this increases the value of t
215-250 r is the position across the screen of the enemy. On the first all these variables are at zero, and as the program passes line 250 a takes the value of r. On the second time round, as the enemy scrolls up the screen, b has the first value of r and a now has the second, and so on until the fifth time when e has the first value o r. By this time the enemy has scrolled up to your position. See line 270
255 Blanks out your craft which has scrolled up two lines from its previous position
260 Redraws your craft
270 Checks to see if your position χ is within three squares — four if t=2 — of the enemy, and if it is a jump is made to line 500
280-290 These move your craft left or right to the value of t depending on which key you are pressing
300 Jumps back to the start of the loop
500 Prints that you have been spotted at your current position
510 Prints your score
515 Invites you to try again

To make this program work on the Spectrum replace lines 180 and 190 with:
180 POKE 23692,3; PRINT
190 PRINT
If the game is then too fast, add:
295 FOR F=1 to 50 NEXT F

```
100 LET A$="▗▀▖"
105 LET N=0
110 LET A=0
115 LET B=0
120 LET C=0
125 LET D=0
130 LET T=1
135 LET X=12
160 LET R=INT (RND*27)
170 PRINT AT 21,R;A$
180 SCROLL
190 SCROLL
200 LET N=N+T
210 IF N=104 THEN LET T=2
215 LET E=D
220 LET D=C
230 LET C=B
240 LET B=A
250 LET A=R
255 PRINT AT 9,X-2;"       "
260 PRINT AT 11,X;"▌▒▐"
270 IF X>=E-2 AND X<=E+T THEN G
OTO 500
280 IF INKEY$="5" THEN LET X=X-
T
290 IF INKEY$="8" THEN LET X=X+
T
300 GOTO 160
500 PRINT AT 11,X-1;"SPOTTED"
510 PRINT AT 0,0;"SCORE=";N
515 PRINT "TRY AGAIN"
```



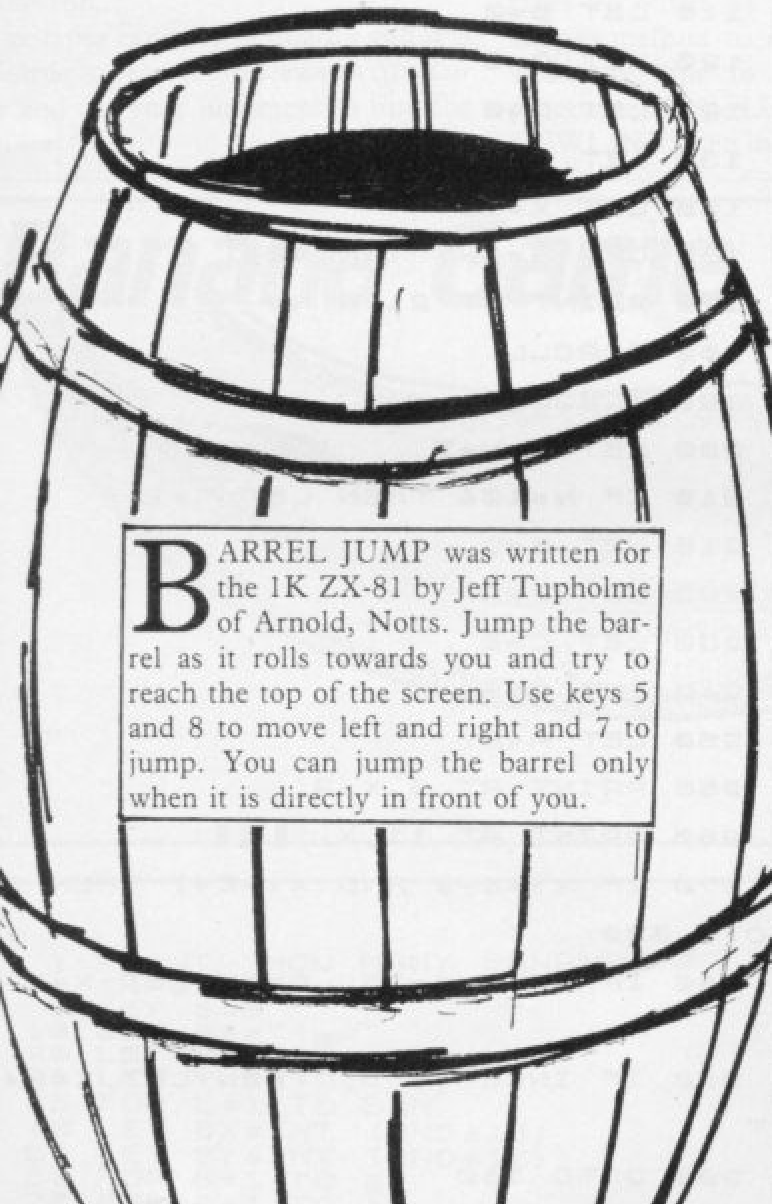
THE WALL

MARK RIDER and Clifford Walker of Enfield, Middlesex have written a simple program for the unexpanded ZX-81. The computer chooses a number between 0 and 30 which you must guess before being hit by the wall.

```
THE WALL FOR 1K ZX81

   1 LET Z=INT (RND*VAL "30")
   2 FOR G=VAL "0" TO VAL "15"
   3 PRINT AT G,VAL "0";"▒▒▒▒▒▒▒▒▒▒
▒▒▒"
   4 PRINT AT VAL "0",VAL "13";"
GUESS THE NUMBER"
   5 PRINT AT VAL "16",VAL "4";"
0"
   6 INPUT V
   7 IF V=Z THEN GOTO 15
   8 NEXT G
   9 CLS
  10 PRINT "YOU HAVE BEEN CRUSHE
D"
  11 PRINT "THE NUMBER WAS ";Z
  12 PAUSE VAL "400"
  13 CLS
  14 RUN
  15 PRINT "WELL DONE,THE ANSWER
 WAS ";Z
  16 GOTO 12
```

BARREL JUMP



BARREL JUMP was written for the 1K ZX-81 by Jeff Tupholme of Arnold, Notts. Jump the barrel as it rolls towards you and try to reach the top of the screen. Use keys 5 and 8 to move left and right and 7 to jump. You can jump the barrel only when it is directly in front of you.

```
 1 LET A=VAL "31"
 2 LET D=VAL "12"
 3 LET B=PI-PI
 4 LET E=VAL "4"
 5 LET F=PI/PI
 6 LET G=VAL "31"
 7 LET H=B
 8 LET I=B
 9 LET C=D
10 FOR J=F TO D+F STEP E
11 FOR K=B TO A
12 PRINT AT J,K;"■"
13 NEXT K
14 NEXT J
15 PRINT AT D,A;" ";AT C,B;" "
16 LET A=A-(INKEY$="5" AND A>H
)+(INKEY$="8" AND A<G)
17 IF INKEY$="7" AND B=A-F THE
N LET A=A-F-F
18 IF D=H AND A=G THEN STOP
19 IF B=G-I THEN LET B=I
20 LET B=B+F
21 IF A=I THEN LET D=D-E
22 LET C=D
23 IF A=I THEN LET B=G-A
24 PRINT AT D,A;"Y";AT C,B;H
25 IF A=B THEN STOP
26 IF A=I THEN LET F=-F
27 IF A=I THEN LET I=31-I
28 GOTO 15
```

Trapping the errors will ensure first-time running

THE FIRST error code encountered by most Sinclair users is the flashing "S" on the ZX-81 or "?" on the Spectrum, which indicates a syntax error in a sentence. Experience and the manual soon show that it is caused usually by typing-in a keyword letter by letter, or by bad punctuation, for example omitting a semi-colon or an inverted comma.

The most frequently-occurring error code is "2" — variable not found. A variable is a letter which has been given a numeric value. When you enter "LET a=2" you are defining a variable. Error code 2 results when the computer reaches a variable in the program to which you have so far given no value.

Check the line which the computer specifies. If it is your program, give a value to the variable or remove it. If you are copying the program, look back in the listing to see which line you have missed.

Although the majority of error codes are explained adequately in the manuals, the report "B-Integer out of range" can be confusing. An integer is a whole number — 1 is an integer, 1.5 and 1½ are not. That code occurs most frequently when you try to print something beyond the limits of the screen.

PRINT AT 0,31; "a" is acceptable and will print a letter "a" at the top right of the screen. PRINT AT 0,32; "a" would not be possible. The integer 32 would be out of range, resulting in error code "B". That would also happen if the computer were instructed to PRINT AT 0,31;"ab". It would still be trying to print a character beyond the limits of the screen.

That error is more difficult to detect if variables have been used as co-ordinates and your character, or series of characters, is being printed in varying positions. If the instruction PRINT AT 0,x;"a" produces report code B, make sure that the value of x never increases beyond 31.

On the Spectrum "B-integer out of range" is also often found when you are POKEing-in user defined graphics. The biggest number which can be POKEd-in this case is 255 or BIN 11111111. In that case the error code will occur in the line containing the POKE statement. In most cases, though, the error will have occurred in one of the DATA lines in the program.

A very frequent error code produced on the Spectrum is "E-Out Of Data". That will occur in a line containing a READ statement. The error code, though, will have occurred in one of the program DATA lines, which may be nowhere near the READ line. A READ command sends the computer to a DATA line to collect the next piece of DATA contained there. That is often done using a FOR, NEXT loop, especially when graphics are being set up.

FOR n=1 TO 8: READ n will send the computer to the DATA lines eight times, for eight separate pieces of information. If there are only seven pieces of DATA there it will return to the READ line and produce the code OUT OF DATA. When there are several DATA lines they will all have to be checked, because the piece of DATA you have omitted was not necessarily the last.

In some cases the computer will follow the program correctly, without producing an error code, but from the programmer's point of view the program contains an error. In that case BREAK into the program at the moment it goes wrong. That will produce report code 9 and the line on which you have STOPped the program. That method makes it easy to locate the area of the program which contains the error.

Programs which you copy from magazines, books or from friends can be difficult to error-trap because they contain programming techniques which you have not yet learned, or simply because it is often difficult to follow another programmer's logic.

The flashing "S" or "?" indicating a syntax error may appear frequently. In that case check carefully what you have copied. You may not have recognised words such as LN or EXP as keywords.

On the ZX-81 especially it is easy to forget that pressing "π" will produce the word PI.

Make sure that when the "is not equal" sign, "< >" appears in a listing you always enter it as one character and not as "is less than", "<" followed by "is greater than", ">".

Technical problems can also cause errors in programs. Any alteration to the power supply can cause a program to CRASH. In that case the screen display may change dramatically and using the keyboard will have no effect. The only solution is to unplug your computer and begin again, making sure that your power supply and RAM pack are both connected firmly. That error is caused by the computer and not by the program.

> 'The error need not be on the line which produces the report; that is simply the line where the computer meets the problem'

Sometimes a program listing in a book or magazine will contain what seems to be a very obvious error. If it contains key words or symbols which are not on your computer, check that it is intended for your machine. Programs for the Spectrum, the ZX-81 and the ZX-80 are not usually directly interchangeable. If a program contains the command GOTO or GOSUB — a non-existent line number — the computer will simply go to the next numbered line after that one. That is a sign that a program has been developed and improved and is rarely an error.

When you have errors in a program, first check the report codes listed in Appendix B of the manual. It may then be necessary to read the appropriate section of the manual. Remember that the error is not necessarily on the line which produces the report code; that is simply the line where the computer meets the problem for the first time.

Always check carefully every line connected with the line containing the error code and the mistake should be easy to locate.

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John Gilbert completes his series by looking at how Forth is used in education and industry

Versatile language aids the human factor

IN THE LAST six months this series has concentrated on what the Forth language can do for the Spectrum and the ZX-81. In the last of the series I want to cover the part of programming techniques called the human interface. It is the part of a computer or a piece of software which takes the human into account during its operations. I want to take the human into account and show how Forth can be used in schools and industry.

Schools and colleges are the obvious places to start as it is at those institutions that computer studies and, for the first time, Forth is being taught. It is at school that most young people learn about computers and examination boards are now treating Forth as a second language to Basic and Fortran.

There are two levels at which it can be used at school. The first is with the teacher, who can add words to the language to demonstrate the principles of a computer in operation. Forth can be turned into an even more high-level language by adding better input and output interfaces, so that the student can use it with ease. They can be stripped from the language as a pupil progresses. Eventually the pupil will be able to use Forth at assembly language level.

Forth will be of use to the pupil on that level in education as a second language. Many schools are taking it that computers such as the Spectrum and ZX-81 use Forth and it is finding a place alongside the traditional and old school languages such as Basic and Fortran. It will train the pupil in machine concepts and make it easier to understand machine code in the long run.

The emphasis on input, output and the stack which the Forth operating system will put on to computer studies can only be good so far as the student is concerned.

> "Forth will make even the ZX-81 into a powerful machine"

Another area which can benefit from the processing power of the language is mathematics, not so much in education but in industry and the sciences.

Unfortunately most of the packages on the market for the Spectrum and ZX-81 offer only integer representation, such as 1324, and not floating point representation, such as 1.324. One company which provides floating point is CP Software, which produces 16K and 48K Spectrum versions of Forth.

Integer Forth is faster than floating point but is usable for most purposes. Floating point Forth lays the emphasis on mathematical procedures and is ideal for scientific work in, say, a laboratory. Such a package could even be used to check variables in an experiment.

The level of sophistication of the language in the laboratory environment can be controlled by defining new words to cope with the expertise, or lack of it, of the staff. One scientist may be able to use Forth unaided whereas another may need the help of an easier Forth structure. Whatever the needs, the Forth language will be able to cope in most situations.

Forth is also ideal for mathematicians as they will be able to cope with the Reversed Polish Notation which is the curse of any student learning the language. The problem is that the arithmetic operators, such as + or −, are put after the operands, such as 2 3 + which means 2+3. Mathematicians can handle

continued on page 108

continued from page 107

that easily and it is one of the factors which increases the speed at which Forth runs, as the computer also handles formulae like this easily.

Another area in which the speed of Forth can be a boon is the creation of graphics, on the screen and on a printer. To produce graphics, such as lines, curves and characters, the user will, in many cases, have to add commands to the language. Luckily, in most of the Sinclair packages, notably Abersoft Forth, graphics features have been incorporated into the dictionary.

Unfortunately the graphics on all the Spectrum packages are only elementary but they show the speed with which pictures can be drawn and manipulated on the screen. The inherent speed factor means that design programs can be written in the language for use by engineers, or even craftsmen who work in metals or pottery. On a more educational level, Forth could be equipped with turtle graphics commands, which means that students can interact with the computer to produce and change pictures on the screen.

As Forth can be compiled, graphics routines using the language can be produced quickly and attached to arcade games or even adventure games.

One area in which Forth can be used to great effect but which is not thought of in Sinclair circles is its ability as a software systems design language. Usually the design of languages and other utility packages for microcomputers and big mainframes is done using either assembly language or specialised systems design languages such as 'C' or machine code.

Again the compilation facilities of Forth make it an ideal language with which to produce other compiled or assembled languages. Utilities such as assemblers could also be created in Forth, which would make it a tool for the design of software which would eventually be used in another microcomputer.

At the moment Forth is being used to write computer language interpreters for mainframe computers but such a system could be used by software houses in the Sinclair market. It would also be possible to write software using Forth on a larger development system, such as those used by Psion, and then download the software to run on a Spectrum or ZX-81.

The technique is common practice in software houses, although few of them use Forth as it is slower than machine code.

The advantage of using Forth for software design is that it is simpler than assembly language and much easier to use than machine code. Large software projects, such as the design of new languages, can be done quickly using Forth and the resulting listings of such projects will be easier to read.

The other advantage is that people who do not know enough about machine code to do complex operations on the Spectrum can produce programs with the power of the language which look professional.

The area of industrial control applications using Forth is massive and I cannot deal with it in much depth. There are, however, several sectors of



industry which can, and do, benefit from Forth as a control language.

The most obvious application in industry is the control of robots in a factory. Forth can be adapted to fit any particular input or output needs required, so that the people who work with the machines can program them if a change of task or speed is required. Large-scale changes can also be incorporated into operating program design in a faster time than if machine code was being used and the machines, which cost thousands of pounds an hour to maintain, will not be idle for long.

The input/output facilities of Forth can also be a benefit in the factory environment which may often have to be under strict control. For instance, a computer programmed with Forth could monitor the temperature on the factory floor by taking readings from a thermometer and then adjust the thermostatic controls. In a similar way various parts of a production line can be controlled very accurately.

All of those uses may seem a long way from the Spectrum and the humble ZX-81 but most of the uses could be programmed on to a Sinclair machine, especially if it contained David Husband's ROMs. Forth will make even the ZX-81 into a powerful machine.

Those are just some of the ways in which Forth will help the human user get along with computers. As an adaptable language it should be useful for most purposes and most users but all the Spectrum and ZX-81 packages have weak areas which could be overcome with a little more thought.

None of the packages on the market is helpful where input/output is concerned. Nobody has gone to the trouble of producing worthwhile examples to drive any peripherals in the hardware line where Forth comes into its own.

One other blasting criticism is that no companies have backed their Forth interpreters with software which can be run on the Spectrum or ZX-81. For instance, the least that could be done are some utilities or programming tools which would make life easier with Forth. Those packages could be supplied separately and create another language market for producers of Sinclair software.

To help promote the Forth language, in which great interest has been shown, *Sinclair User* and *Sinclair Programs* would like to print programs in Forth as well as Basic. They can be simple games or complex utilities, so long as they are well-documented.

Also, although this is the last article in this series, I will be producing one more article on the subject in a few months which will answer any general questions which you may still have about the language. If you have such questions, write to me at *Sinclair User.* I cannot answer individual queries but will try to deal with as much as possible in the article.

In the meantime, you may like to look at some recommended books on the subject. *The Complete Forth,* by Alan Winfield, is published by Sigma Technical Press. It will introduce you to most of the concepts of Forth but describes the Forth 79 standard which is slightly different from Fig-Forth. Others books which can be recommended are best obtained from a good library. They include *The Systems Guide to Fig-Forth* and *Starting Forth* by Leo Brodie.

Alternatively you could join the Forth Interest Group, an organisation which started in the U.S. but which has a branch in Britain. It can be reached at 15, St. Albans Mansion, Kensington Court Place, London W8 5QM.



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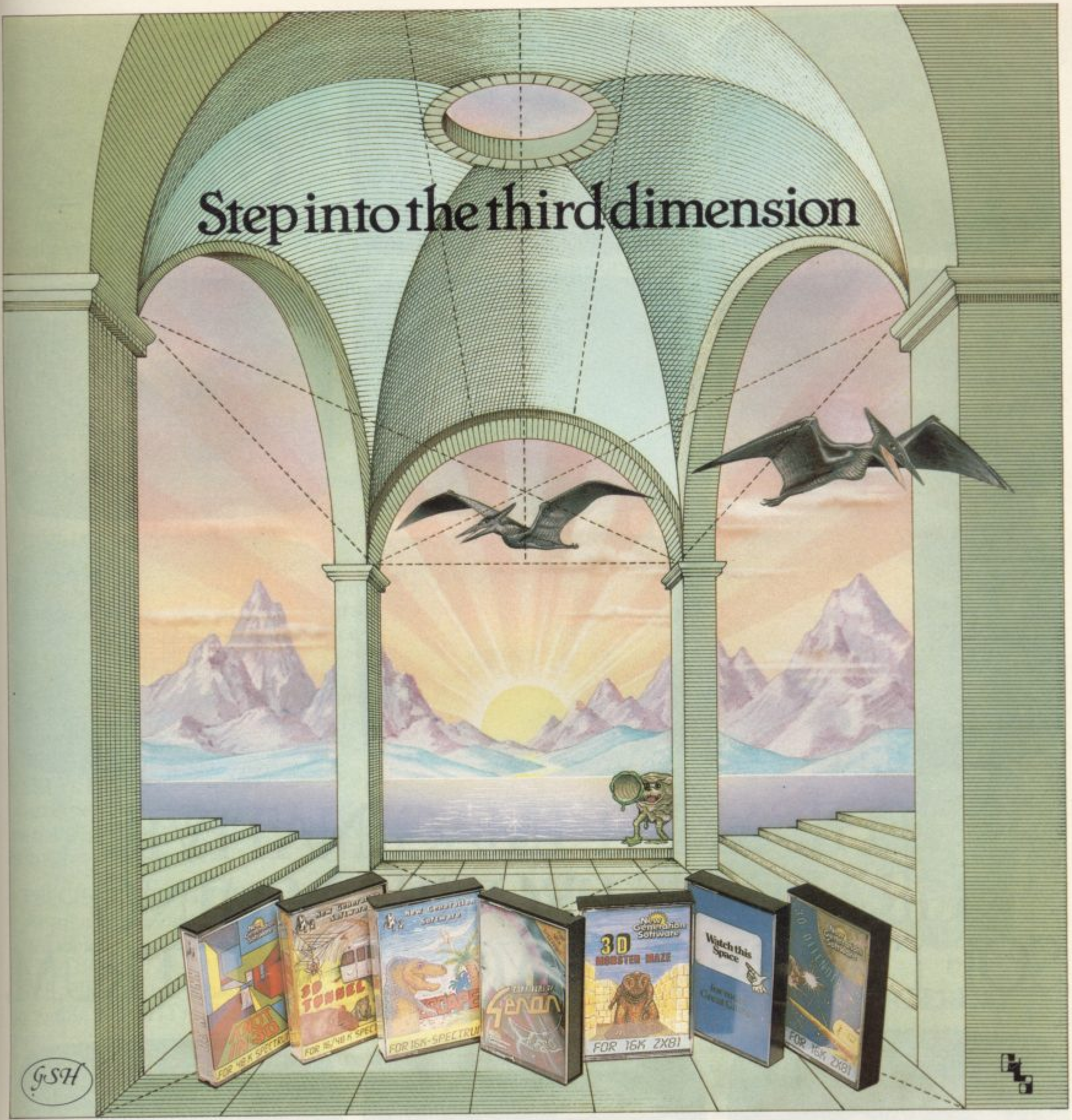
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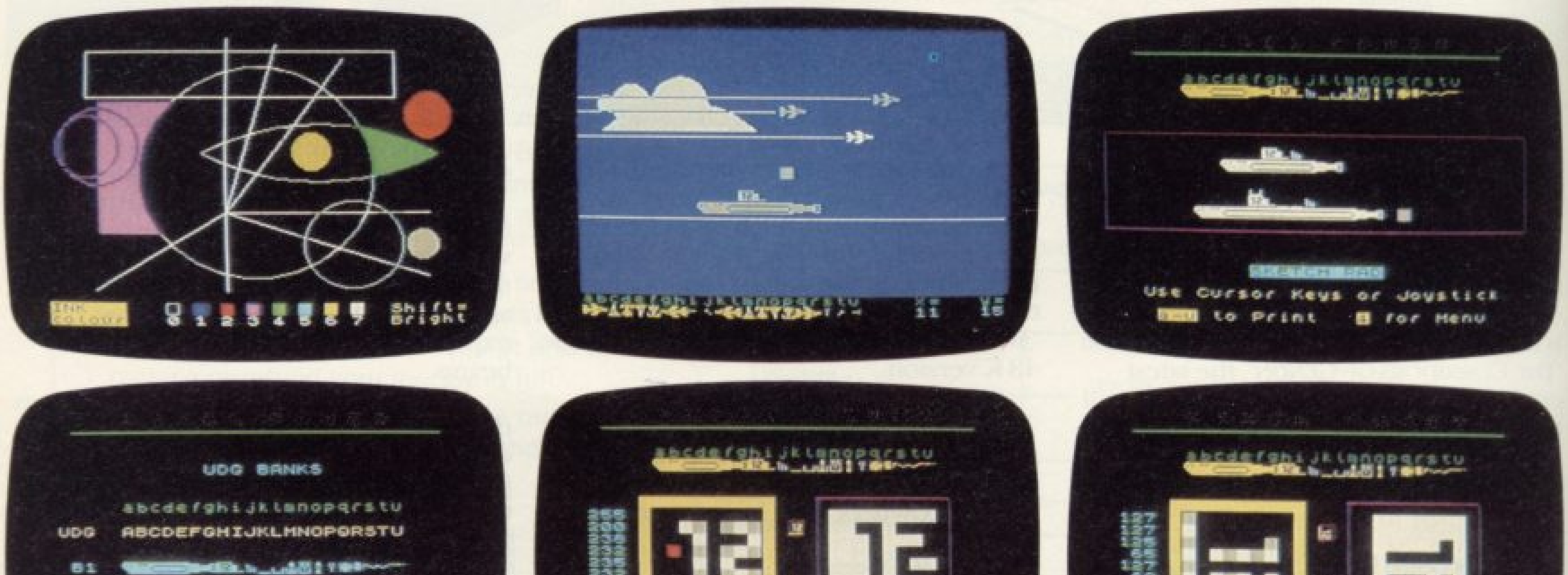
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Good software counts in learning arithmetic

This month Theodora Wood looks at programs which aim to help children with their sums

MANY PROGRAMS which deal with arithmetical skills provide drill situations and can be seen as the extension of the workbooks and worksheets which children use at school. Their educational aims therefore are relatively modest but include the fact that the programs familiarise children with computers, but only as a drill machine.

Hot Dog Spotter — Longman, Spectrum 16/48K, £7.95 — is an example. Designed to appeal to young children and to give them practice at counting, its format borrows features from arcade games. Dice drop from the top of the screen and the child has to recognise the number (1-9) on the dice before it reaches the bottom. If correct, the ball is returned to its pot; if incorrect, the numbers are counted out and the ball is lost. After three balls are lost the game is finished.

The child has to ENTER his name and a high score is kept. The game adjusts to the player's skill; if the correct number is pressed when the ball is in the yellow zone, three points are awarded, if pink two points, and the green zone scores only one point. If most entries are in the lower half of the screen the game will consist of the lower numbers. The action is fast so there is very little time to count the numbers, especially since they are not presented in conventional dice formation.

Countabout — Longman, Spectrum 16/48K, £7.95 — operates on three levels of difficulty — addition, subtraction and a combination of both. A box appears in the middle of the screen with a number of objects in it — telephones, crocodiles, boats or any other of the nine objects. A sum appears at the left-hand side, for example 2+?=4, and the child has to press the required number.

If incorrect, there are two more attempts, until the correct answer is shown. If correct, the box is filled with the correct number of objects and the chimpanzee moves up the banana tree on the left of the screen until it finally reaches the bananas at the top and the game is finished. Unlike Hot Dog Spotter, there is no time element, so the child can count the numbers carefully.

Both the programs illustrate the single program concept; there is no opportunity to change any of the parameters and, because a child's attention span is short, they cannot be used for very long periods. By contrast, **Party Time** — Clever Clogs, Spectrum 48K, £6.50 — is geared to overcome that problem. Aimed at the three-plus age group, a variety of six activities is provided, all LOADed at the same time. A menu is provided and the child can choose any of the activities, although there are times when the computer will choose.

Included in the activities are two arithmetical ones — Counting and How Many? — which show in the first instance objects to be counted on the screen and in the second simple additions. The correct answer is given after three incorrect attempts. No more than four of them needs to be done at any one turn and then there is a nursery rhyme before returning to the menu. The parameters can be set for both.

Jungle Jumble — Clever Clogs, Spectrum 48K, £6.50 — develops the idea further for older children. Ten questions have to be answered while a picture of an animal is built and a safari game can be played. Among the questions are some simple arithmetical problems, such as three boys share six sweets, how many each? One hundred questions are provided and the opportunity is given to edit the questions to suit the individual child. By providing variety and the opportunity to personalise its programs, Clever Clogs has produced a much more flexible package than the one-game format Longman used.

Model Maths — Jive Software, Spectrum 48K, £5.75 — provides two programs based on real-life situations. Dartscore is a simulated game of darts in which the computer throws the darts and the player keeps the score on three levels of difficulty. Beginners have to add the total score of five darts, juniors start with 51 and count down, and experts begin with 101 and do the same.

Balance simulates a set of scales and the player has four choices, to match a given weight up to 20, to find a secret weight up to 20, and the same for numbers up to 99. The child must put weights on the scales to make them balance. Avoiding the absolute correct or incorrect result of many arithmetic programs, Balance enables a child to play with combinations of numbers to achieve the correct result. Only 1, 2, 5, 10, 20 and 50 are used, reflecting our currency.



EDUCATION

Learning tables is an example of rote learning which has provided software houses with an opportunity to invent a variety of approaches to aid a child to reach the position to supply an answer with no conscious effort. Chanting the tables in a classroom situation rather like a mantra is the traditional way of arriving at that position and **Know Your Tables** — Collins, Spectrum 16/48K, £5.95 — borrows this methodology and develops it further by providing a visual aid in the form of a number grid.

There is a choice of building a multiplication table or learning a table. The child can choose which table to build from one to 10; the computer then builds a grid of numbers from one to 50 and when the higher tables are chosen that continues up to 100. Then the child has to answer the questions, for example 1×3=? and continues until the table reaches 10×3.

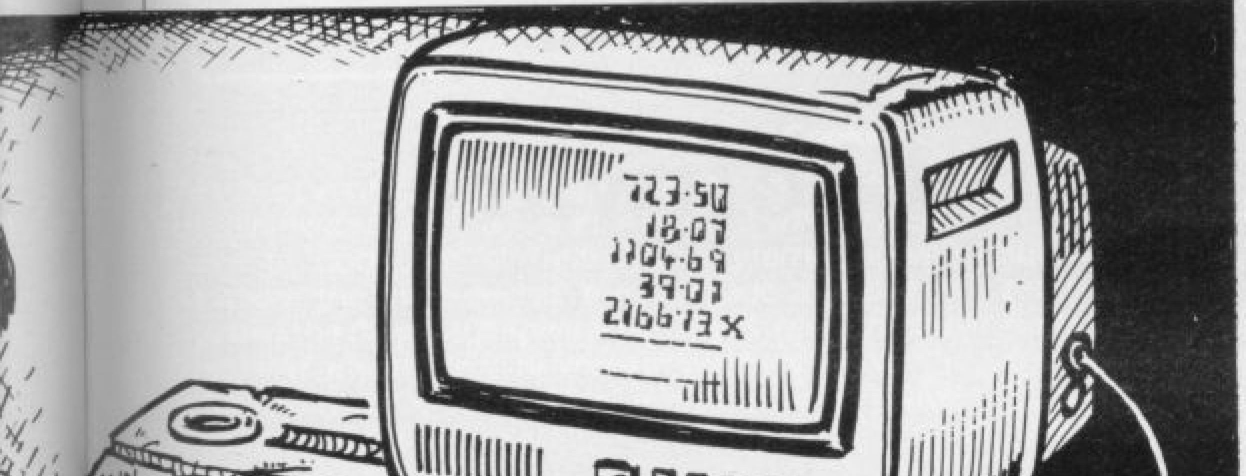
When that is complete the child has to learn the flashing line, 9×3=27, and then say it three times. Learn a Table builds the grid and then colours the appropriate numbers, so the child can see the pattern as it is built, then learning the flashing line and saying it three times. The program is accompanied by a workbook which provides numerous activities to support the learning provided by the tables on screen.

A less conventional way of learning tables can be seen in Robot Tables included in **Quick Thinking** — Mirrorsoft, Spectrum 48K, £6.95. There are two choices of speed — slow for learning and fast for testing — and there is a choice of which tables to include, ranging from 2 only to 9, 6, 8, 7, 12. A large robot machine is fed with numbered blocks; the tables number is displayed and the child has to accept the block by pressing 1 or reject the block by pressing SPACE. The answers work through a given table in sequence 4, 8, 12, 16 and if the player does not press anything or gives an incorrect answer, the block goes up in smoke or a bad robot is made.

If correct, a good robot is made amid much whirring and clicking; correctly-rejected blocks are re-cycled. Points are awarded for correct answers and lost for incorrect ones.

Also on Quick Thinking is Sum Vaders, a drill routine to practise addition and subtraction, suitable for all ages from five to adult. There is a choice of one or two players who can be given different skill levels to play, varying from using numbers up to nine to adult level. A numbered space ship drops a numbered robot; if the answers given are correct the robot disintegrates; an incorrect answer jams the ship and the correct answer is shown when the robot lands; when five robots have landed the game is finished. The program provides practice in the skills of mental arithmetic but could also be used as calculator practice.

The format is also used in **Maths Invaders** — Stell Software, Spectrum 16/48K, £6.95. The player can choose addition, subtraction, multiplication or division at any of six levels. A score is kept at the top of the screen while the sum appears at the bottom. If the correct answer is given the player can fire a gun at the invaders by pressing any key; that can also be moved by pressing O or P but is rather unresponsive. The graphics are also disappointing and not up to the standard of the Longman package.



Jungle Maths — Scisoft, Spectrum 48K ZX version, £6.95 — is another drill program in fancy packaging. The parent or teacher can set the parameters of the game before it begins. There is a choice of addition or subtraction at three levels from less than 10 to less than 1,000. Practice with decimals and negatives can be chosen and the time limit varied from 20 seconds to five minutes 20 seconds. Pressing X while the child is doing the problems will give the number of incorrect answers.

The aim is to pass through the jungle at the top of the screen; to move a space requires the correct answer. If an incorrect answer is given the player is overtaken by one of the hazards, falling into the pit or being eaten by piranhas.

The difficulty with that approach is that giving an incorrect answer produces a more spectacular result than the correct answer and children operating

continued on page 116

continued from page 115

the program alone will learn that quickly. It also seems strange that, although Scisoft seems to be aiming at both the home and school market, there is no opportunity to change the parameters without reLOADing the program, which could be very time-copnsuming in a classroom.

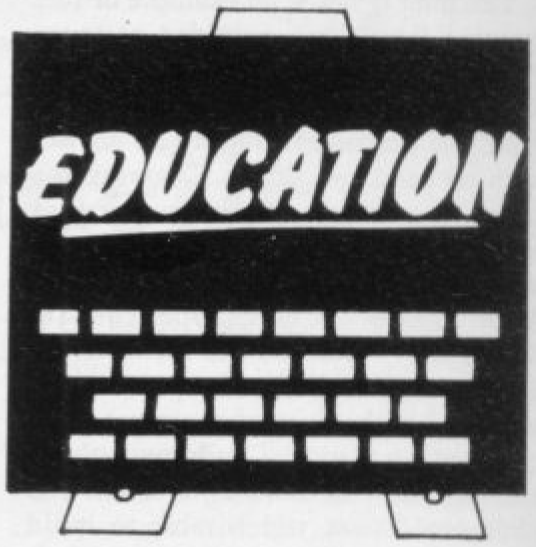
Paddington's Shopping Mix-up — Collins, Spectrum 16/48K, £6.95 — takes a completely different approach from all the other programs discussed in that it introduces sums of all kinds in a story-time format. There is a Paddington story book with the tape and the activities are based on it. Five programs are provided, each to be LOADed separately. Paddington features in all the programs, so if a child is a Paddington fan it will have a certain appeal.

'Their success will differ according to the preferences of both parent and child'

Plenty of counting practice is provided in Grocer, counting apples and carrots as they go on to the scale. Sums provides a choice of six skill levels in all four types but the skill level moves up with correct answers, which can be rather daunting. Which, Doubles and Labels all provide more arithmetical situations and in the case of Doubles it is in the form of a board game to be played by one or two players, with counting practice in the form of dice thrown.

All the programs are examples of the various ways in which the Spectrum graphics, sound and animation capabilities have been used to make sums more entertaining. The majority of the programs will be used by parents and children at home, as the ratio of children to computers in schools is only 200:1.

The implications are various. Will there emerge a group of children with greater skill in these areas due to the extra practice obtained on home computers? Will parents feel more able to teach children at home by using these materials? Another consideration is that of the importance of obtaining a high degree of skill in an area where it is no longer necessary; decimalisation of the currency, calculators, electronic tills, have all altered life and work involving



arithmetic skills radically. At a basic level, the programs are materials to be used with the computer as a learning machine and their success will differ according to the individual preferences of both parent and child — we cannot all love Paddington.

Programs by **Longman**, **Microsoft** and **Collins** are widely available in stores.
Clever Clogs, Computertutor, PO Box 3, St Neots, Cambs PE19 3NW.
Stell Software, 36 Limefield Avenue, Whalley, Lancs BB6 9RJ.
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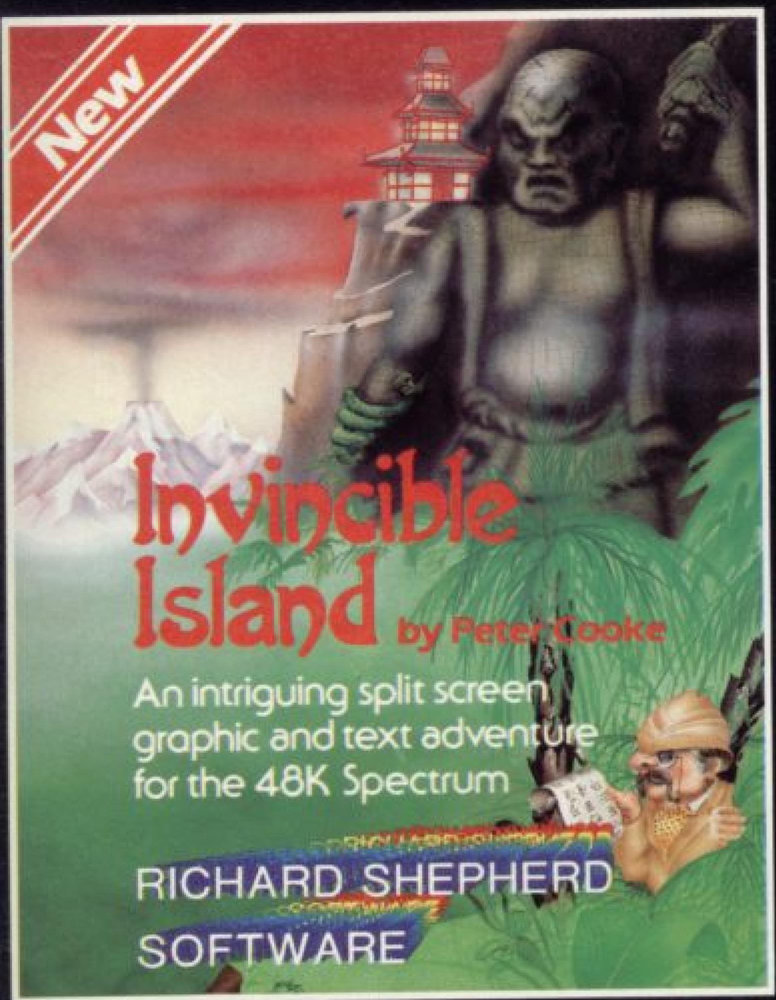
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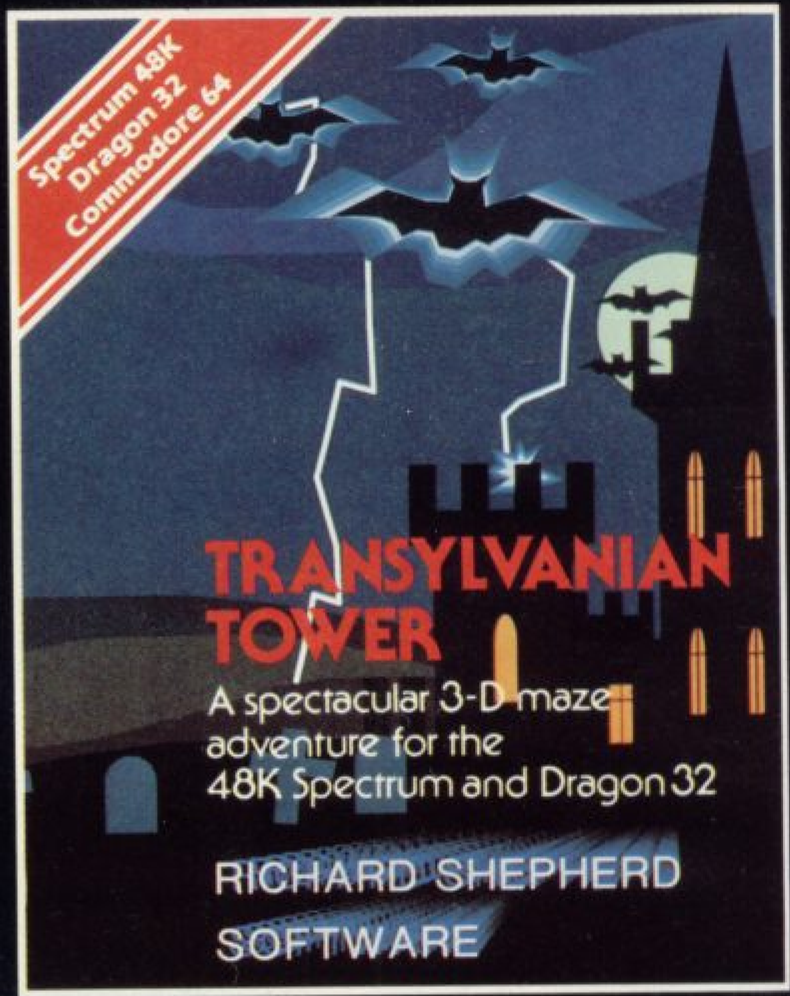
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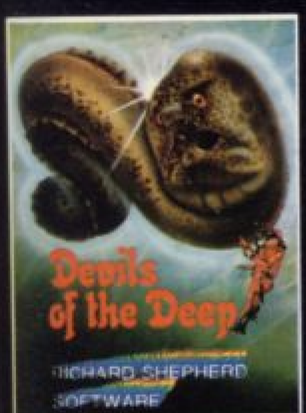
Transylvanian Tower

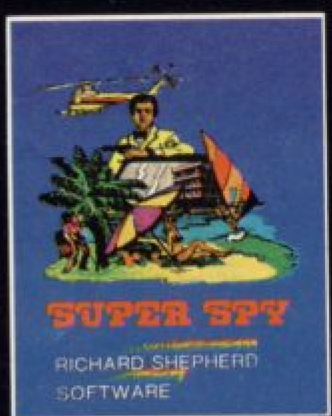
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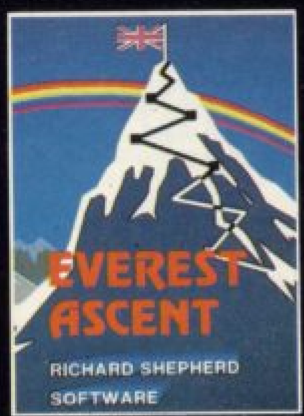
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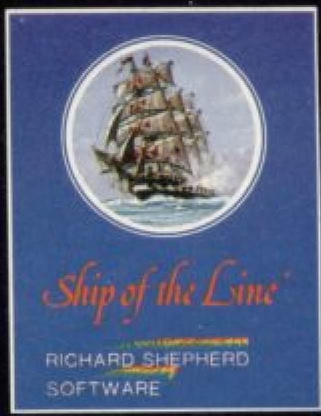
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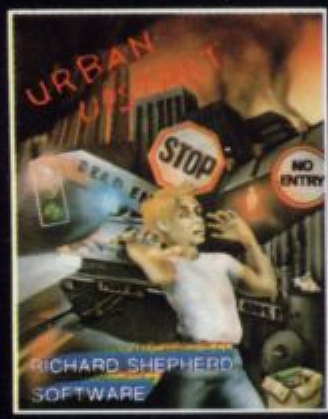
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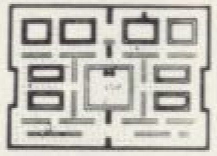


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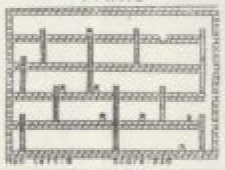
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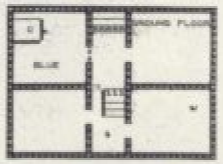
CENTIPOID (machine code).
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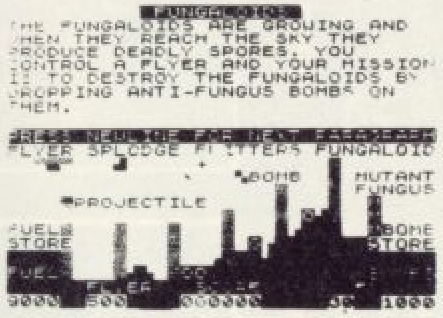
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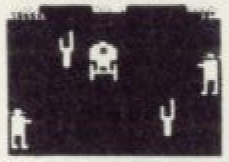
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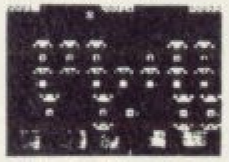




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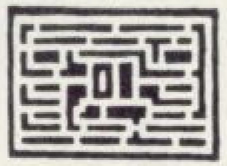
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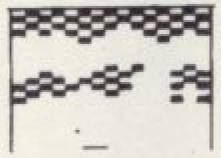
BYTE-MAN (machine code)
(previously available from Mindseye)



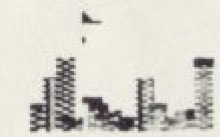
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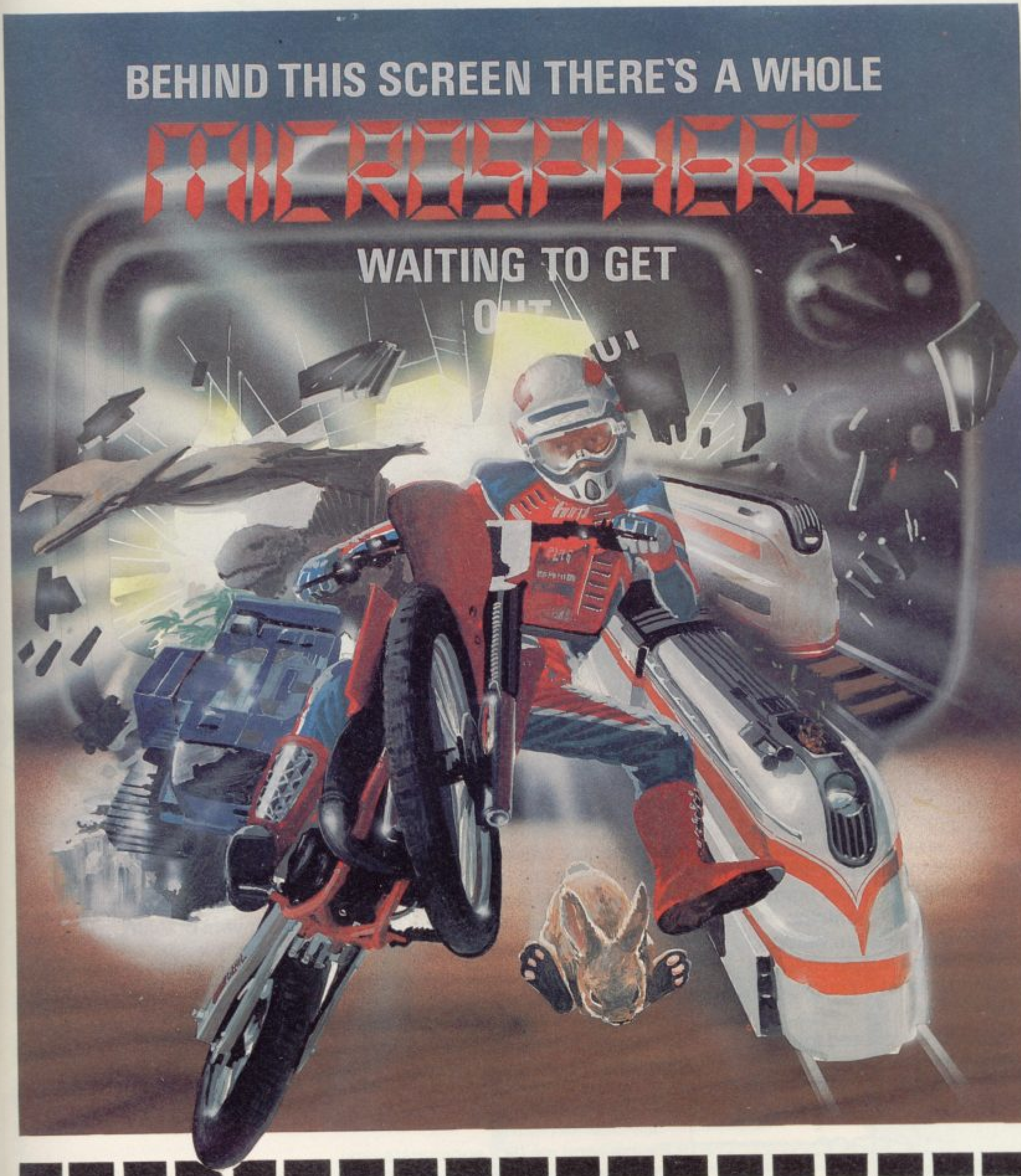
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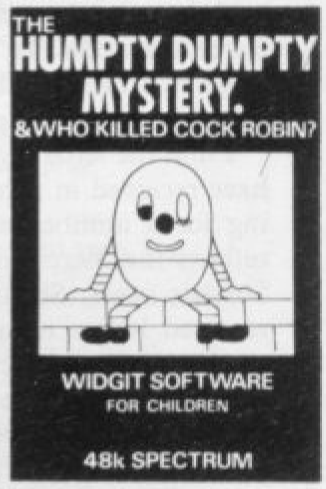
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Manipulating the sprites to eliminate flickering

Our expert Andrew Hewson introduces a graphics routine which makes use of the Spectrum attributes file

IN THE TWO YEARS I have been writing this column I have observed the gradual changes in the requests I have received. In the early days almost all the letters concerned the ZX-81 and most of them were fairly straightforward. These days roughly two out of every three are from Spectrum owners and very often the topic on which information is requested would need several chapters of a book to do it justice.

Take, for example, this letter from Falgun Patel of Harrow, Middlesex. He writes: **I am having great difficulty with a car game program which I am writing. The car is printed at the bottom of the screen and as it scrolls off the screen it has to be re-printed, causing a flickering. Another problem is that because the car is two characters high and two characters wide the top of the car appears briefly where the bottom of the car should be. On the Commodore 64 the problem can be solved by using sprite graphics which are not affected when the screen scrolls. Is there a machine code routine which simulates sprite graphics on the Spectrum?**

I find the letter, typical of a number I have received in recent weeks, interesting for a number of reasons. First, it reflects the increasing sophistication of Sinclair users. Six months ago I often received letters requesting routines for scrolling the entire Spectrum screen and I dealt with the topic at that time. Falgun has observed that there are games for the Spectrum on the market which appear to use sprite graphics — i.e., they scroll different parts of the screen independently of one another — and therefore wishes to incorporate the feature in his own software.

Second, his letter implies that a manchine code routine to generate and manipulate sprite graphics should be fairly straightforward to design and write. That is a common assumption made by many correspondents who believe that I must produce this kind of routine in the odd half-hour between *Coronation Street* and supper-time. Unfortunately that is



• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

not true. There was a lag of about 15 months between the launch of the Spectrum and the time when the first 'sprite-like' games appeared on the market. Modesty forbids me to claim that I am quicker than anyone else at this kind of job.

Third, the letter is a challenge to write some software which will be of interest to most readers and stimulate a few to develop and extend it. I am not one to decline such a challenge readily.

Having accepted the challenge, it did not take long to realise that a complete response was impossible in the space available. Hence the software presented serves to demonstrate the principle of sprite graphics using only the Spectrum attributes file. That approach has the advantage that the routines can be adapted in a fairly straightforward manner to run on the ZX-81 and I explain how to do so at the end of this column.

A sprite can be defined as a portion of the display image which can be moved independently of all other features of the display. Software for generating and handling sprites must be capable of dealing with a reasonable number of them simultaneously and it should be possible to overlay two or more sprites at the same position on the screen. When overlaid, sprites should either appear to pass behind or to pass through one another.

The background forms an important component of a sprite display because the software must re-build it every time a sprite passes over it. A plain background is the simplest to handle and so I have adopted this form. The fundamental rule to remember is to check before plotting each component part that the part of the display which will be covered by the sprite is part of the background. In that way you will ensure that sprites are plotted only on the background and never on one another.

Similarly, when unplotting a sprite to move it elsewhere always check that the item to be "painted over" is part of the sprite being considered. If you do not observe that procedure you will find that the display will become cluttered with portions of sprites left over from previous cycles.

To reduce flickering, each sprite must dwell on the screen for as long as possible, hence the basic steps in any sprite program are unplot sprite from old position; plot sprite at new position; repeat those two functions for each sprite in turn; execute all other routines incorporating delays if necessary; and return to the first situation.

> 'Software for generating and handling sprites must be capable of dealing with a reasonable number of them simultaneously'

If step one is executed for all sprites and then step two is executed for all sprites, the images will appear to pass in front and behind one another. Alternatively if step one, then step two are executed for each sprite in turn, the images will appear to superimpose on one another. The latter procedure is probably more appealing to the eye but with a large number of sprites the flick-

ering can become pronounced. The routines in table one can be used to plot and unplot a single sprite and the Basic program in table two shows how the routines can be used to drive two or more sprites.

Because of the complexity of the routines I have departed from my usual procedure of giving a ready-assembled list of machine code. Hence the reader will almost certainly wish to use an assembler program when loading the routines into his machine. The routines and their functions are:

RESETBG — Paint the attributes file uniformly using the colour code stored in address 23551 the last byte of the printer buffer.

OFFSET — The IX register holds an address. Locations IX and IX+1 hold the column number and row number respectively of the position of the upper right corner of the current sprite in the attributes file. Calculate the corresponding address in the file and store it in HL.

PLOTGROUP — The main routine which plots, if the B register contains 0, or unplots, if the B register contains 1, a sprite. This routine calls:

PLOTLINE — Plots or unplots a line of sprite characters by calling:

PLOTLOC — Plot or unplot a character location at the address held in HL from the data at the address held in DE, when plotting or 23551, when unplotting.

The data for each sprite is held as follows:

IX + 0 — column number in attributes file.

IX + 1 — row number in attributes file.

IX + 2 — width of sprite in characters.

IX + 3 — height of sprite in characters.

IX + 4 — This address is transferred to DE. DE + 0 to DE + (IX + 2) * (IX + 3) define the sprite.

continued on page 124

Label	Assembly code	Comment
ORG 50000		Assemble code at address 50000.
RESETBG	LD HL,22528	Address of attributes to HL.
	LD BC,768	Length of attributes to BC.
BG	LD A,(23551)	Background code to A.
	LD (HL),A	Paint background at (HL).
	INC HL	Move to next location.
	DEC BC	Decrement length counter.
	LD A,B	Test to see if
	OR C	task is complete.
	CP 0	
	JR NZ,BG	Repeat if incomplete.
	RET	Return on completion.
OFFSET	LD HL,22528	Address of attributes to HL.
	LD B,0	Clear register B.
	LD C,(IX+0)	Load column counter into C.
	ADD HL,BC	Move to position of column.
	LD C,(IX+1)	Load row counter into C.
	LD DE,32	32 is length of one attribute line.
NEXTLINE	LD A,C	Move to position of row
	CP 0	using the calculation
	JR Z,END	(jump if calculation complete)
	ADD HL,DE	HL = HL + C * DE.
	DEC C	
	JR NEXTLINE	Continue calculation.
END	PUSH IX	Transfer value in IX to DE
	POP DE	via the stack.
	INC DE	Increment DE
	INC DE	four times so that
	INC DE	it points to the colour information
	INC DE	for the group.
	RET	Return
PLOTGROUP	LD A,0	Clear A register.
	LD C,(IX + 3)	Load C with height of group.
LINE	PUSH HL	Save current position.
	CALL PLOTLINE	Plot a line from the group.
	POP HL	Retrieve previous position.
	DEC C	Decrement height counter
	CP C	and
	RET Z	return if group is complete.
	PUSH DE	Save position in group colour info.
	LD DE,32	Step down by one line
	ADD HL,DE	in the attributes file.
	POP DE	Retrieve position.
	JR LINE	Jump to plot next line in group.
PLOTLINE	LD A,(IX + 2)	Load A with width of group.
LOC	CALL PLOTLOC	Call routine to plot next location.
	INC HL	Increment location in attributes file.
	INC DE	Increment position in colour group info.
	DEC A	Decrement width counter.
	CP 0	Repeat if
	JR NZ,LOC	line is not complete.
	RET	Return on completion.
PLOTLOC	PUSH AF	Save group width counter.
	LD A,B	If B contains 0 then sprite is to be
	CP 0	plotted, otherwise
	PUSH BC	(save value in B)
	LD B, (HL)	(load B with contents of location)
	JR Z,PLOT	it is to be unplotted.
	LD A,(DE)	Unplot — load A with colour info.
	CP B	Compare with contents of location.
	JR NZ,ENDP	If dissimilar then do nothing.
	LD A,(23551)	Contents and colour info identical
	LD (HL),A	hence paint location into background.
	JR ENDP	Jump to end.
PLOT	LD A,(23551)	Plot — load a with background colour.
	CP B	Compare with contents of location.
	JR NZ,ENDP	If dissimilar then do nothing.
	LD A,(DE)	Contents and background identical
	LD (HL),A	hence paint in part of sprite.
ENDP	POP BC	Recover plot/unplot flag.
	POP AF	Recover width counter.
	RET	Return
ORG 51000		Assemble at 51000
	LD IX,23296	Data on first sprite is at 23296.
	CALL OFFSET	Define position in attributes file.
	LD B,0	Set plot/unplot flat to PLOT.
	CALL PLOTGROUP	Plot first sprite.
	RET	Return.
ORG 51100		Assemble at 51100
	LD IX,23296	Data on first sprite is at 23296.
	CALL OFFSET	Define position in attributes file.
	LD B,1	Set plot/unplot flat to UNPLOT.
	CALL PLOTGROUP	Unplot first sprite.
	RET	Return.
ORG 51200		Assemble at 51200
	LD IX,23306	Data on second sprite is at 23306
	CALL OFFSET	Define position in attributes file.
	LD B,0	Set plot/unplot flat to PLOT.
	CALL PLOTGROUP	Plot second sprite.
	RET	Return.
ORG 51300		Assemble at 51300
	LD IX,23306	Data on second sprite is at 23306
	CALL OFFSET	Define position in attributes file.
	LD B,1	Set plot/unplot flag to UNPLOT.
	CALL PLOTGROUP	Unplot second sprite.
	RET	Return.

Table 1. A Spectrum assembly language program which, when driven from the Basic program in table two, demonstrates the principles of "sprites" by manipulating two groups of characters in the attributes file.



continued from p123

I have listed the routines as if they were to be assembled at address 50000. I have then listed four routines to be assembled at 51100, 51200, 51300, 51400 which plot and unplot each of two sprites.

The principal alterations when transferring the routines to the 16K ZX-81 are:

Choose new locations to store the data and re-set IX accordingly; use the address held in D FILE instead of 22528 throughout; alter OFFSET and PLOTGROUP to take account of the single marker byte at the end of each 32-character display line on the ZX-81.

```
10   POKE 23298,2                 : REM Width of first sprite.
20   POKE 23299,3                 : REM Height of first sprite.
30   FOR I=23300 TO 23305         : REM Colour of sprite is to be
40   POKE I,60                    : REM green INK on white PAPER.
50   NEXT I

60   POKE 23308,3                 : REM Width of second sprite.
70   POKE 23309,2                 : REM Height of second sprite.
80   FOR I=23310 TO 23315         : REM Colour of sprite is to be
90   POKE I,40                    : REM black INK on cyan PAPER.
100  NEXT I

110  POKE 23551,32                : REM Background PAPER to green.
120  RANDOMIZE USR 50000          : REM Reset background colour.
200  INPUT "ROW1";I               : REM Enter position of first
210  INPUT "COLUMN1";J            : REM sprite.
220  POKE 23296,I
230  POKE 23297,J
240  RANDOMIZE USR 51000          : REM Plot first sprite.
300  INPUT "ROW2";I               : REM Enter position of second
310  INPUT "COLUMN2";J            : REM sprite.
320  POKE 23306,I
330  POKE 23307,J
340  RANDOMIZE USR 51200          : REM Plot second sprite.
400  PAUSE 0                      : REM Pause to inspect effect.
410  RANDOMIZE USR 51100          : REM Delete first sprite.
420  RANDOMIZE USR 51300          : REM Delete second sprite.
500  GO TO 200                    : REM Repeat.
```

Table 2. A Spectrum Basic program to drive the "sprite" routines listed in table one.



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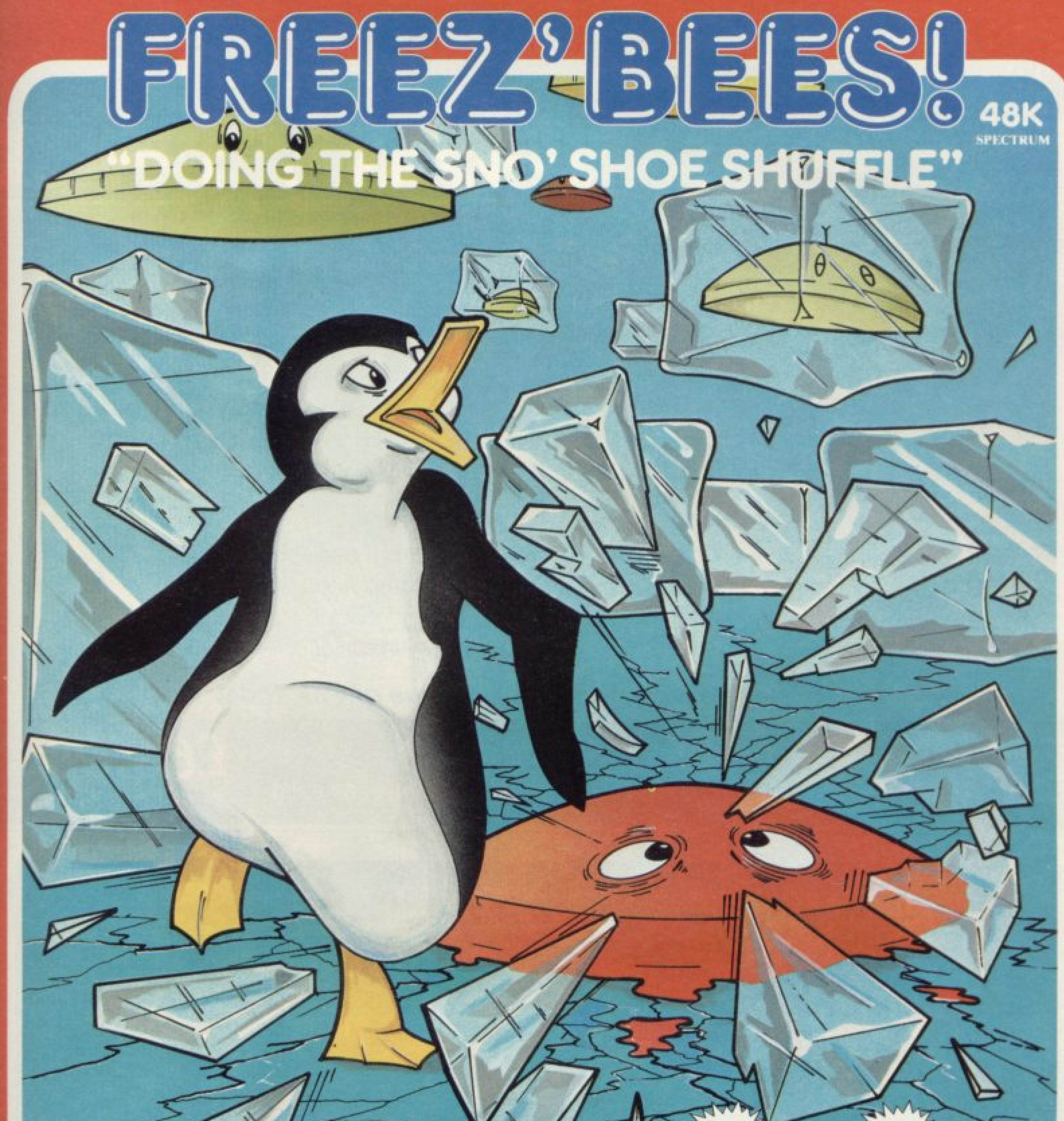
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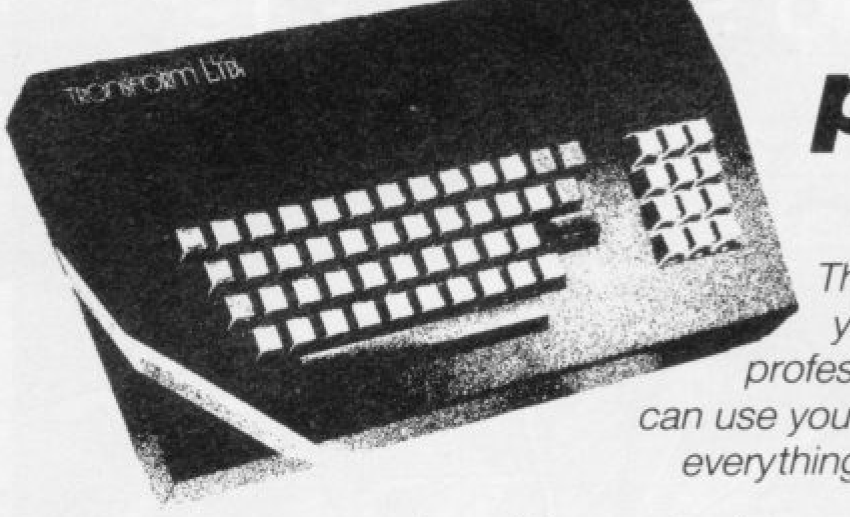
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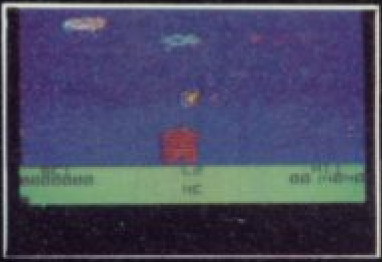
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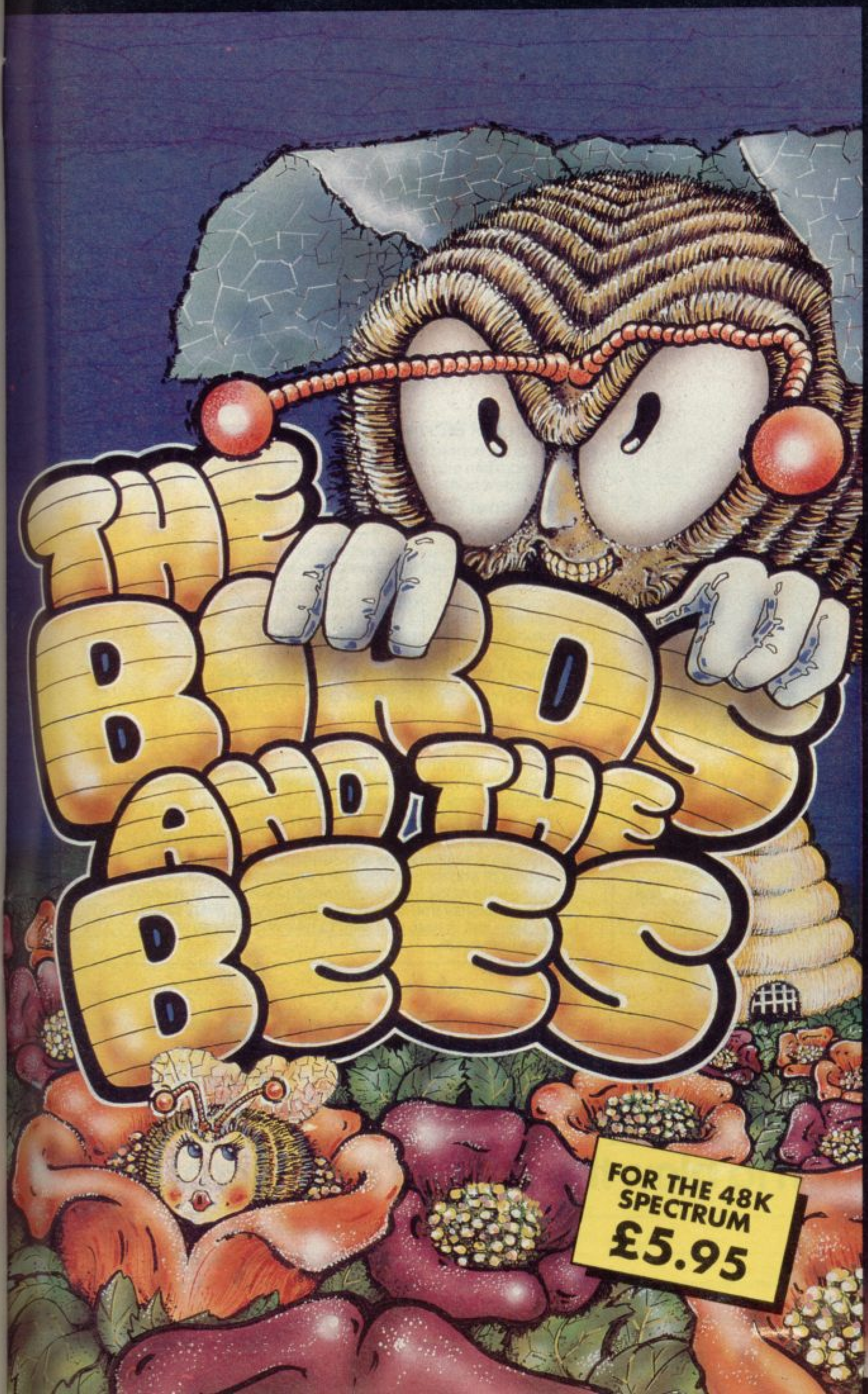
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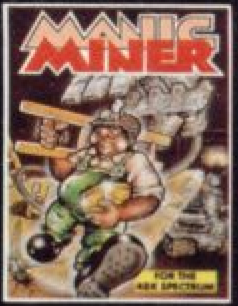




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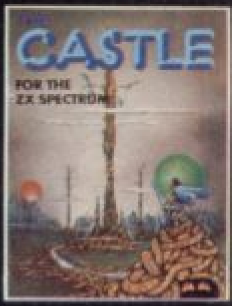
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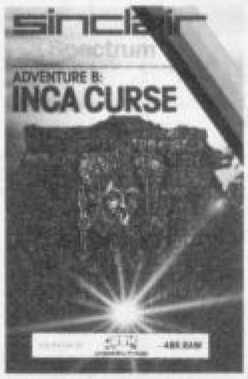
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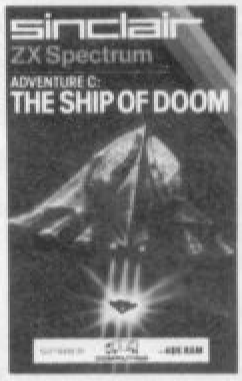
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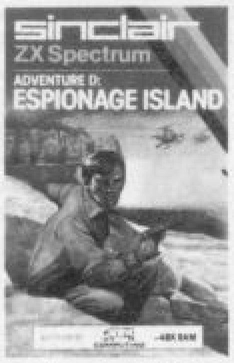


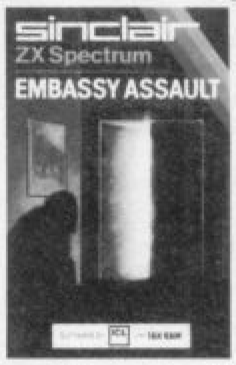
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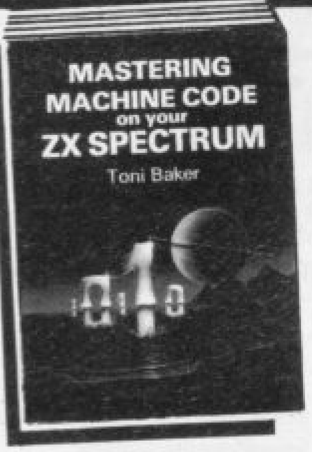
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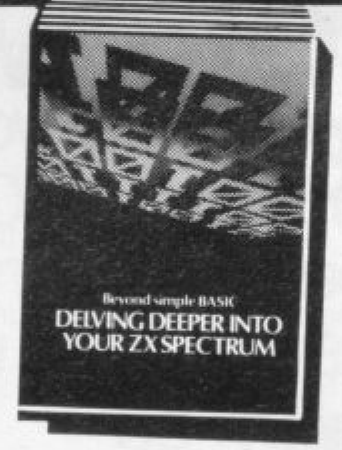
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Roll up, roll up! Circus has come to town

Quentin Heath investigates the secret of the Big Top

AS THE NUMBER of Spectrum adventures on the market increases, it is difficult to find one which is different in either concept or content. Adventures are usually graphics or text only and take place in underground locations, mysterious fantasy worlds, on battle fields, or in outer space.

That is not true of the Mysterious Adventure series from Digital Fantasia. One adventure from the company shows the differences from other adventures and the advances in both plot and quality the company has brought to the adventure market. The game is called **Circus** and it is for the 48K Spectrum.

Circus is slightly different in format from other adventures, as you can switch between high-resolution graphics and text with an extra push of the ENTER key. The plot is unusual, as it takes place in and around a shadowy circus ground.

Few hints are given as to what you should do in the circus or what you are seeking, but that is as it should be. The packaging gives some hints as to what to do when it indicates that you have become stranded near a circus when your car runs out of petrol.

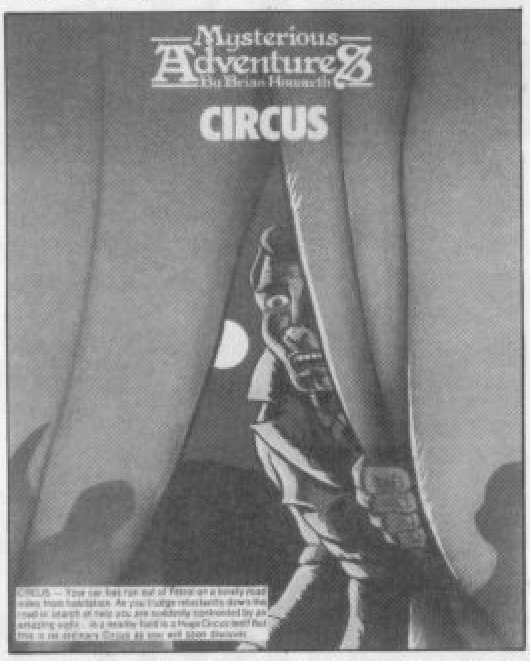
The car is not the starting-point of the adventure and that could confuse you. It is a deliberate ruse to convince you that the car contains nothing of interest. First, you will find yourself in a field with only a few compass-point directional movements, such as south, east and west, from which to choose.

At the start it may seem as if you are limited in the moves you can make and to get anywhere into the game you need to discover an arcane secret of great difficulty. Nothing could be further from the truth. All you have to do is think of a different and more specific type of movement command, such as go, and then specify the direction in which you want to move. That makes the game very complex, as you will have to name the sites you want to visit in different sectors.

The main sectors in Circus are the field in which you start, the road and car which you can reach, using Go road followed by Go car, and the circus exterior and interior where much of the action will take place. Each of those sectors is discussed in the hints and tips panel.

One of the quests you will have to undertake is to find the petrol with which to fill your car to make your getaway. It could be in the generator which you will find near the circus or it could be in the dark depths of the tent. The generator is not working, so there is no power to go exploring in the tent. You will have to find your own, with a little help from hints and tips.

The secret of the petrol lies in the tent but you might like to explore the traps and pitfalls before you start to be



involved with the quest. Learning from experience is usually the name of the game but there are some problems you can avoid with commonsense.

You may make a reasonable guess that most of the circus act equipment you find is in the tent and in the circus ring. The ladder you find hanging in mid-air. It seems to go up to the roof of the tent and is a temptation — if you ever wanted to swing on the trapeze you will find your wish granted if you can find the proper words to swing up to the top beams and canvas of the roof. If you jump from the trapeze you will land on the canvas of the roof and find nothing.

If you have a knife you could become a vandal, as the computer will accept the command to cut the canvas. Not much else seems to be possible from that vantage point and it is at that point, when you want to return to the ground, that you may have difficulty.

You may wish you had a map of the steps you took to get up to your precarious position. If you have not made a map you will become confused between ladders and swings. What you must not do is take out your rope, if you have it, and throw it. You might expect to find a quick way to the ground but the only thing you will get is a lost rope.

One other place to avoid is the human canon, unless you are trying to escape from the clown who keeps appearing. That character does little damage but he is difficult to follow.

One last strange, but useful, tip which can be given is that you should try and dig with your spade at every opportunity. No more said but you never know what you might discover.

Unfortunately not all software companies have the definition of an adventure game, in the computer sense, completely correct. Penguin Books calls its **Korth Trilogy** an adventure consisting of three separate cassette-and-book packages.

The packages contain only a series of arcade games based on all-too-familiar concepts. Many of them seem to have been written first, with the story-line slotted around them afterwards.

The saddest aspect is that the concept of this series of packages, based on traditional adventure lines, is fascinating and more software companies should try it.

The only advice I can give if you still intend to buy Korth Trilogy is to keep the science fiction story-book with the package and throw away the cassette. The relationship between the two is thin and you would be much less embarrassed if you did not look at the software. Penguin is, on the whole, better as a publisher of literature and might be advised to stay in that field.

HINTS AND TIPS

Useful items hidden close to the hand.
Dig with a spade in a field.
Your car is not as useless as it seems.
Look in the boot before you scream.

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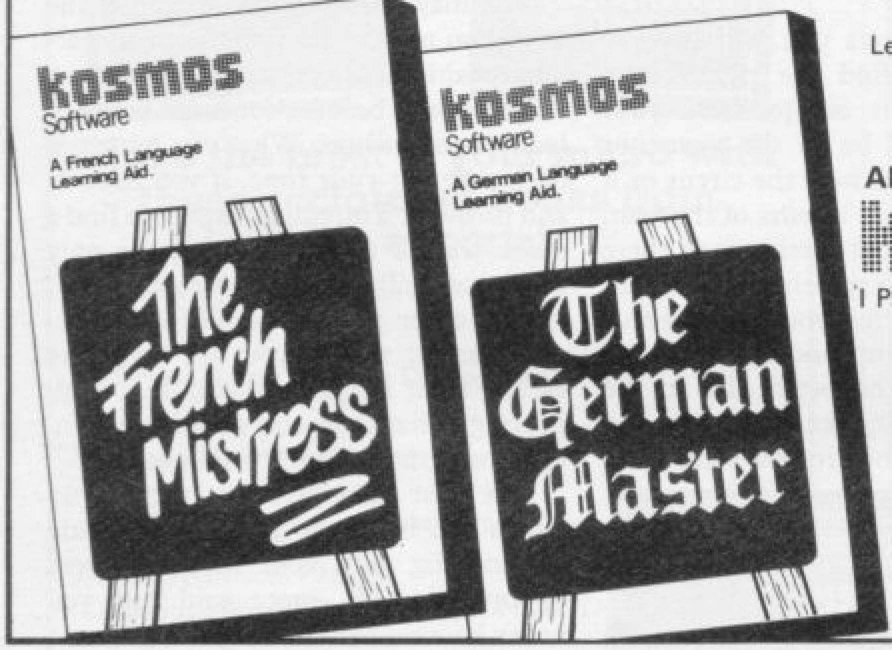
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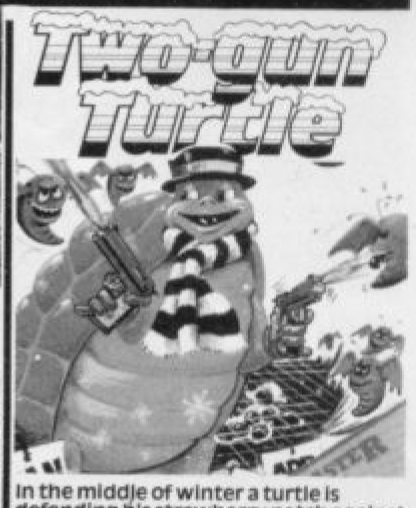


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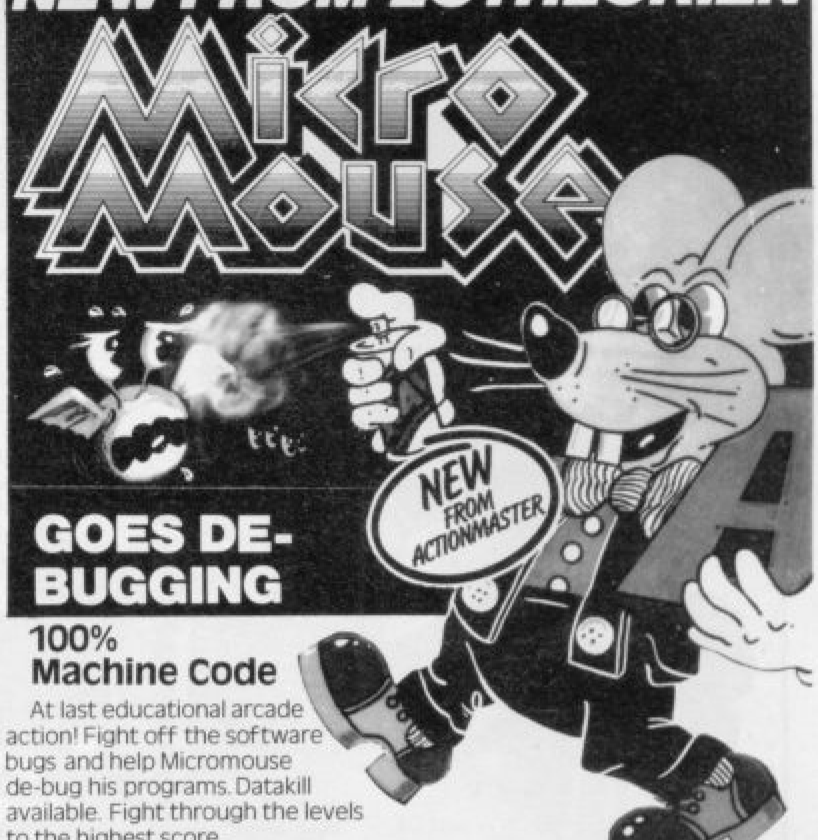
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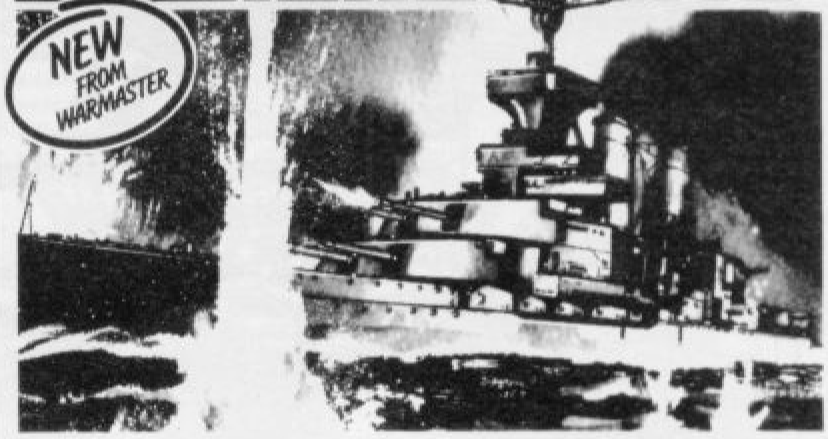


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Name	Machine	Company	Type	Gilbert factor
ABC Liftoff	48K Spec.	Longman	Education	*
Abyss	48K Spec.	CCS	Adventure	6
Accounts (Limited company)	16K ZX-81	Hestacrest	Business	*
Accounts (Limited Company)	48K Spec.	Hestacrest	Business	*
Accounts (Sole Trader)	16K ZX-81	Hestacrest	Business	*
Accounts (Sole Trader)	48K Spec.	Hestacrest	Business	*
Ace in the Hole	48K Spec.	Add-on	Adventure	*
Address File	48K Spec.	SD Micro	Business	2
Address Manager	48K Spec.	OCP	Business	7
Adventure 1	16K ZX-81	Abersoft	Adventure	6
Adventure 1	48K Spec.	Abersoft	Adventure	6
Adventure Isl.	48K Spec.	Contrast	Adventure	*
Air Traffic Controller	16K Spec.	Hewson	Sim.	6
Airline	16K ZX-81	CCS	Sim.	7
Airline	48K Spec.	CCS	Sim.	7
Airliner	16K Spec.	Protek	Sim.	6
Alchemist	48K Spec.	Imagine	Adventure	*
Alien Dropout	16K ZX-81	Silversoft	Arcade	*
Allsort S–1	48K Spec.	A Firminger	Utility	7
Alphabet	16K Spec.	Widget	Education	*
Alphabet Games	16K Spec.	Sinclair	Education	*
Android One	16K Spec.	Vortex	Adventure	*
Ant Attack	48K Spec.	QS	Arcade	8
Apocalypse	48K Spec.	Red Shift	Mind Game	*
Apostrophe	16K Spec.	Sinclair	Education	7
Aquarius	16K Spec.	Bug-Byte	Arcade	6
Arcadia	16K Spec.	Imagine	Arcade	5
Arcadian	16K Spec.	J K Greye	Arcade	6
Arcane Quest	48K Spec.	Add-on	Adventure	*
Arcturus	48K Spec.	Visions	Adventure	*
Armageddon	48K Spec.	Silversoft	Arcade	*
Aspect	16K Spec.	Bug Byte	Utility	5
Assassin	16K Spec.	Spectrasoft	Arcade	*
Assembler	48K Spec.	Artic	Utility	6
Asteroids	16K ZX-81	Silversoft	Arcade	8
Asteroids	16K ZX-81	Software Farm	Arcade	6
Astral Convoy	16K ZX-81	Vortex	Arcade	*
Astrology	16K Spec.	Stellar Servs.	Utility	7
Astrology	16K ZX-81	Stellar Servs.	Utility	*
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Auto Chef	16K Spec.	CCS	Sim.	*
Auto Chef	16K ZX-81	CCS	Sim.	*
Avenger	16K Spec.	Abacus	Arcade	*
Backgammon	16K Spec.	Hewson	Mind Game	*
Backgammon	48K Spec.	CP	Mind Game	7
Ballooning	16K Spec.	Heinemann	Education	*
Baltic Patrol	16K Spec.	E. Midland	Arcade	*
Bank Account Syst.	48K Spec.	K Gouldstone	Business	8
Bank Raid	16K ZX-81	J M Senior	Game	*
Bank Verifier	48K Spec.	SD Micro	Business	*
Baron	16K Spec.	Temptation	Arcade	*
Barrow Quest	16K ZX-81	Sherry	Adventure	*
Base Invaders	16K Spec.	Imagination	Arcade	*
Base Invaders	48K Spec.	Work Force	Arcade	6
Battle 1917	48K Spec.	CCS	Strat.	8
Battle of Britain	48K Spec.	Microgame	Strat.	*
Battleships	16K ZX-81	JRS	Strat.	*
Beamscan	48K Spec.	Beamscan	Utility	9
Bear Bovver	48K Spec.	Artic	Arcade	8
Beta Basic	16K Spec.	Betasoft	language	9
Beyond Basic	48K Spec.	Sinclair	Utility	*
Big Match Soccer	16K Spec.	Winters	Strat.	*
Biorythms/Pyramids of Egypt	16K Spec.	Spectrasoft	Game	*
Black Crystal	16K ZX-81	Carnell	Adventure	7
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Black Dwarf's Lair	48K Spec.	Newsoft	Adventure	*
Black Hole	16K Spec.	Quest	Arcade	6
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Bridge Tutor	16K Spec.	CP	Mind Game	*
British Lowland	48K Spec.	CCS	Sim.	*
Bug Blaster	16K Spec.	Crystal Comp.	Arcade	*
Bugaboo	48K Spec.	QS	Arcade	7
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Business Bank Account	48K Spec.	Transform	Business	*
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Byter	16K ZX-81	Protek	Arcade	*
Calpac 1	16K Spec.	Calpac	Education	*
Calpac 1	16K ZX-81	Calpac	Education	*
Calpac 2	16K Spec.	Calpac	Education	*
Calpac 2	16K ZX-81	Calpac	Education	*
Calpac 3	16K Spec.	Calpac	Education	*
Car Journey	16K Spec.	Heinemann	Education	*
Cargo	16K Spec.	Sinclair	Education	*
Caribbean Trader	48K Spec.	E. Midland	Adventure	*
Caribbean Trader	48K Spec.	E. Midland	Adventure	7
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Cash Controller	48K Spec.	Shepherd	Business	7
Cassette 1	1K ZX-81	Orwin	Arcade	*
Cassette 2	16K ZX-81	Orwin	Arcade	*
Cassette 3	16K ZX-81	Orwin	Arcade	*
Cassette 4	16K ZX-81	Orwin	Arcade	*
Cassette 5	16K ZX-81	Orwin	Arcade	*
Cassette A	16K Spec.	Orwin	Arcade	*
Castle Colditz	16K ZX-81	Felix	Adventure	*
Castle Colditz	48K Spec.	Felix	Adventure	*
Castle Spellerous	48K Spec.	Sinclair	Education	8
Caterpillar	16K Spec.	CDS	Arcade	*
Cavernfighter	16K Spec.	Bug-Byte	Arcade	*
Centi-bug	16K Spec.	DK Tronics	Arcade	*
Challenge	16K Spec.	Temptation	Trad.	*
Character Gen	16K Spec.	Spectrasoft	Utility	*
Chequered Flag	48K Spec.	Sinclair	Arcade	8
Chess Tutor 1	48K Spec.	Sinclair	Education	*
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Chuckman	48K Spec.	Add-on	Arcade	*
City Defence	16K Spec.	Mikro-Gen	Arcade	*
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Countries of the World	16K Spec.	Hewson	Utility	8
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Critical Path Analysis	16K ZX-81	Hilderbay	Business	6
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Crypt	48K Spec.	Carnell	Adventure	6
Cyber Rats	16K Spec.	Silversoft	Arcade	7
Cyber Zone	48K Spec.	Crystal Comp.	Arcade	*
Cycle Planner	16K Spec.	Medidata	Utility	4
Dallas	16K Spec.	CCS	Sim.	6
Dallas	16K ZX-81	CCS	Sim.	6
Database	48K Spec.	Microl	Business	7
Deffendar	48K Spec.	Mikro-Gen	Arcade	*
Demolition	16K ZX-81	Comp. Rntls.	Game	*
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Name	Machine	Company	Type	Gilbert factor
Derby Day	48K Spec.	Comp. Rntls.	Game	*
Designer	16K Spec.	Matrix	Utility	*
Destroyer	16K Spec.	Winters	Game	*
Detective	48K Spec.	Arcade	Adventure	7
Devil Rides In	48K Spec.	Carnell	Arcade	7
Devils of Deep	48K Spec.	Shephard	Adventure	*
Dictator	16K Spec.	Bug Byte	Strat.	*
Diet	48K Spec.	DK Tronics	Utility	*
Diet Master	48K Spec.	Diet Master	Utility	6
Dietron	16K Spec.	Custom	Utility	6
Dimension Destructors	48K Spec.	Artic	Arcade	8
Disassembler	16K Spec.	dK' Tronics	Utility	7
Display	16K Spec.	Work Force	Utility	*
DIY Book-keeping	48K Spec.	RAMTOP	Business	*
DLAN	48K Spec.	Campbell	Utility	*
Do Not Pass Go	16K ZX-81	Work Force	Strat.	*
Do Not Pass Go	48K Spec.	Work Force	Strat.	6
Dodge City	48K Spec.	Phoenix	Arcade/ adventure	*
Door Slammer	16K ZX-81	Cathedral	Arcade	7
Dr. Whom	16K ZX-81	D. Biggs	Adventure	*
Draft	16K ZX-81	Myrmidon	Business	*
Draughts	48K Spec.	CP	Mind Game	7
Dungeon Master	48K Spec.	Crystal Comp.	Adventure	8
Dungeons of Doom	16K ZX-81	Woosoft	Adventure	*
Dungeons of Doom	48K Spec.	Temptation	Adventure	*
Dymonoids	16K Spec.	Dymond	Game	*
Editor/Assembler	16K Spec.	Picturesque	Utility	8
Education One	16K Spec.	Lerm	Education	*
Educational	16K Spec.	Startersoft	Education	*
Elektro Storm	48K Spec.	PSS	Arcade	*
Engine Diagnostic	48K Spec.	Spectrasoft	Utility	*
Escape	16K Spec.	New Generation	Maze	8
Espionage Isl.	16K ZX-81	Artic	Adventure	*
Espionage Isl.	48K Spec.	Artic	Adventure	5
Everest Ascent	48K Spec.	Shepard	Adventure	6
Evolution	48K Spec.	Microsphere	Game	*
Ext	48K Spec.	Abbex	Arcade	6
Family Games Pack	16K Spec.	Hornby	Game	*
Farmer	16K Spec.	CCS	Sim.	*
Farmer	16K ZX-81	CCS	Sim.	*
Fighter Pilot	16K ZX-81	Digital Int.	Sim.	5
Finance Manager	16K Spec.	OCP	Business	9
Firework Music	16K Spec.	Soft Cottage	Education	8
Flight Sim.	16K ZX-81	Sinclair	Sim.	6
Flight Sim.	48K Spec.	Sinclair	Sim.	6
Flippit	16K Spec.	Sinclair	Puzzle	7
Football	16K Spec.	Winters	Sim.	*
Football Manager	16K ZX-81	Addictive Gms.	Sim.	*
Football Manager	48K Spec.	Addictive Gms.	Sim.	7
Football Pools Program	16K ZX-81	Hartland	Utility	*
Football Pools Program	48K Spec.	Hartland	Utility	*
The Forest	48K Spec.	Phipps	Simulation	*
Forth	16K ZX-81	Sinclair	Language	7
Forth	48K Spec.	Sinclair	Language	7
Forth	48K Spec.	Melbourne Hse.	Language	9
Four Rules of Number	16K Spec.	Micro Master	Education	*
Four Rules of Number	16K ZX-81	Micro Master	Education	*
FP Compiler	16/48 Spec.	Softek	Utility	9
French Mistress	48K Spec.	Kosmos	Education	*
French Voc Test	16K Spec.	Tutorial	Education	*
French Voc Test	48K Spec.	Tutorial	Education	*
Froggy	16K Spec.	DJL	Arcade	7
Froggy	16K ZX-81	DJL	Arcade	7
Fruit Line	16K Spec.	P A Hanson	Game	*
Fruit Machine	16K Spec.	dK' Tronics	Game	6
Full-screen Breakout	1K ZX-81	New Generation	Arcade	*
Galactians	16K Spec.	DK Tronics	Arcade	*
Galactic Trooper	16K Spec.	Romik	Arcade	3
Galaxians	16K Spec.	Artic	Arcade	6
Galaxy Conflict	16K Zx-81	Martech	Strat.	8
Galaxy Conflict	48K Spec.	Martech	Strat.	*
Gambling Tape	16K Spec.	Dymond	Game	*
Games	16K ZX-81	P Teakle	Game	*
Games 2	16K ZX-81	JRS	Game	*
Games Pack 1	16K Spec.	A Burnham	Game	*
Games Tape 1	16K Spec.	Sospan	Game	*
Games Tape 1	1K ZX-81	J K Greye	Game	*
Games Tape 2	16K Spec.	Sospan	Game	*
Games Tape 2	16K ZX-81	J K Greye	Game	*
Games Tape 3	16K ZX-81	J K Greye	Game	*

Name	Machine	Company	Type	Gilbert factor
Gangsters	48K Spec.	CCS	Strat.	8
General Election	48K Spec.	Bug-Byte	Sim.	*
Ghost Hunt	16K Spec.	PSS	Arcade	*
Gnasher	16K Spec.	R & R	Maze	8
Go To Jail	48K Spec.	Automata	Trad.	*
Gobble-a-Ghost	16K Spec.	CDS	Arcade	*
Gobbleman	16K Spec.	Artic	Arcade	*
Gobbleman	16K Zx-81	Artic	Arcade	*
Gobbler	16K ZX-81	Software Farm	Arcade	*
Golden Apple	48K Spec.	Artic	Adventure	7
Golf	16K Spec.	R & R	Sim.	7
Golf	16K Spec.	Virgin	Sim.	8
Golf	48K Spec.	DK Tronics	Sim.	*
Gorgon	48K Spec.	Phipps	Adventure	*
Gorilla	16K Spec.	D Hornsby	Game	*
Grand Prix	16K ZX-81	dK' Tronics	Arcade	*
Graphics	16K ZX-81	IPA	Utility	*
Graphics Toolkit	16K ZX-81	JRS	Utility	9
Great Britain Ltd	16K ZX-81	Hessel	Strat.	*
Great Britain Ltd	48K Spec.	Hessel	Strat.	7
Greedy Gulch	16K ZX-81	Phipps	Adventure	7
Ground Attack	16K Spec.	Silversoft	Arcade	6
Ground Force Zero	16K Spec.	Titan	Arcade	*
Guitar Tutor 1	48K Spec.	Harlequin	Education	*
Guitar Tutor 2	48K Spec.	Harlequin	Education	*
Gulp 2	16K ZX-81	Campbell	Arcade	*
Gulpman	16K Spec.	Campbell	Arcade	*
Halls of Things	48K Spec.	Crystal Comp.	Adventure	9
Handwriting	48K Spec.	Chalksoft	Education	*
Hanoi King	48K Spec.	Contrast	Mind Game	*
Haunted Hedges	16K Spec.	Micromega	Arcade	6
Heathrow	16K Spec.	Hewson	Sim.	8
Hidden Letters	16K Spec.	Poppy	Education	*
High Noon	48K Spec.	Work Force	Arcade	9
High-resolution Invaders	16K ZX-81	Odyssey	Arcade	*
Hobbit	48K Spec.	Sin/M.Hse.	Adventure	9
Hole	48K Spec.	Add-on	Adventure	*
Home Computer Pack	16K Spec.	SD Micro	Bus.	*
Horace and the Spiders	16K Spec.	Sinclair	Arcade	8
Horace Goes Skiing	16K Spec.	Sinclair	Arcade	8
Horror Atoll	48K Spec.	Add-on	Adventure	*
Hot Dot Spotter	16K Spec.	Longman	Education	*
Hungry Horace	16K Spec.	Sinclair	Arcade	8
Hunter Killer	48K Spec.	Protek	Strat.	9
I Ching	48K Spec.	Sirius	Game	*
Inca Curse	16K ZX-81	Sinclair	Adventure	*
Inca Curse	48K Spec.	Sinclair	Adventure	6
Inkos	48K Spec.	Chalksoft	Sim.	*
Integration	16K Spec.	University	Utility	8
Integration	16K ZX-81	University	Utility	8
Intermediate English 1	16K Spec.	Rose	Education	*
Intermediate English 1	16K ZX-81	Rose	Education	*
Intermediate English 2	16K Spec.	Rose	Education	*
Intermediate English 2	16K ZX-81	Rose	Education	*
Intermediate Maths 1	16K Spec.	Rose	Education	*
Intermediate Maths 1	16K ZX-81	Rose	Education	*
Intermediate Maths 2	16K Spec.	Rose	Education	*
Intermediate Maths 2	16K ZX-81	Rose	Education	*
Invaders	16K ZX-81	Abersoft	Arcade	*
Invaders	16K ZX-81	Bug Byte	Arcade	*
Invaders	16K ZX-81	Silversoft	Arcade	*
Invasion Force	16K Spec.	Artic	Arcade	8
Invincible Isl.	48K Spec.	Shephard	Adventure	8
Jackpot	48K Spec.	Comp. Rntls.	Arcade	*
Jericho Road	48K Spec.	Shards	Adventure	*
Jet Pac	48K Spec.	Ultimate	Arcade	8
Jogger	16K Spec.	Severn	Arcade	*
Johnny Reb	48K Spec.	Lothlorian	Sim.	*
Keysounder	16K Spec.	S and G	Utility	*
King Arthur	48K Spec.	E. Midland	Simulation	*
Knight's Quest	16K ZX-81	Phipps	Adventure	*
Knight's Quest	48K Spec.	Phipps	Adventure	6
Krazy Kong	16K ZX-81			
	48K Spec.	PSS	Arcade	*
Labyrinth	16K Spec.	Axis	Arcade	4
Language Devel. Series	16K Spec.	Glasson	Education	*
Language Devel. Series	16K Spec.	Micro Master	Education	*
Language Devel. Series	16K ZX-81	Glasson	Education	*

Name	Machine	Company	Type	Gilbert factor
Language Devel. Series	16K ZX-81	Micro Master	Education	*
Las Vegas	16K Spec.	Temptation	Strat.	*
Lazatron	48K Spec.	Contrast	Arcade	*
Leap Frog	16K Spec.	CDS	Arcade	*
Learn Basic	16K Spec.	Logic 3	Education	*
Learn to Read 1	48K Spec.	Sinclair	Education	7
Learn to Read 2	48K Spec.	Sinclair	Education	7
Learn to Read 3	48K Spec.	Sinclair	Education	7
Learn to Read 4	48K Spec.	Sinclair	Education	7
Learn to Read 5	48K Spec.	Sinclair	Education	7
Learning Read 1	16K Spec.	Poppy	Education	*
Leopard Lord	48K Spec.	Add-on	Adventure	4
Light Cycle	16K Spec.	PSS	Arcade	*
Linear Progging	16K Spec.	University	Utility	*
Linear Progging	16K ZX-81	University	Utility	*
List File	48K Spec.	SD Micro	Utility	*
Lost Island	16K ZX-81	JRS	Adventure	*
Lost Over Bermuda	48K Spec.	Add-on	Adventure	*
Luna Crabs	16K Spec.	Micromega	Arcade	7
Lunar Jetman	16K Spec.	Ultimate	Arcade	*
Machine Code Test Tool	16K Spec.	OCP	Utility	7
Machine Code Test Tool	16K ZX-81	OCP	Utility	*
Mad Martha	48K Spec.	Miko-Gen	Adventure	7
Mad Martha II	48K Spec.	Mikro-Gen	Adventure	*
Magic Mountain	16K ZX-81	Phipps	Adventure	*
Magnets	48K Spec.	Sinclair	Education	*
Mailing List	16K ZX-81	Hestacrest	Business	*
Make-a-Chip	48K Spec.	Sinclair	Education	*
Manic Miner	48K Spec.	Bug-Byte	Arcade	9
Marks Book	16K Spec.	Lerm	Utility	*
Masterfile	48K Spec.	Campbell	Business	8
Masterfile 16	16K Spec.	Campbell	Business	*
Matcalc	16K Spec.	Work Force	Utility	*
Maths Tutor	16K Spec.	AD Software	Education	*
Matrix Operations	16K Spec.	University	Utility	7
Matrix Operations	16K ZX-81	University	Utility	7
Maze Chase	16K Spec.	Hewson	Arcade	8
Maze Death Race	16K ZX-81	PSS	Arcade	*
Maze Death Race	48K Spec.	PSS	Arcade	*
Maze Man	16K ZX-81	Abersoft	Arcade	*
Maziacs	48K Spec.	dK' Tronics	Arcade	8
Mazogs	16K ZX-81	Bug Byte	Arcade	*
MCoder	16K Spec.	PSS	Utility	8
MCoder	16K ZX-81	PSS	Utility	8
Melbourne Draw	48K Spec.	Melbourne Hse.	Utility	7
Merchant of Venus	16K ZX-81	Crystal	Adventure	7
Meteor Madness	16K Spec.	Spectresoft	Arcade	*
Meteor Storm	16K Spec.	Quicksilva	Arcade	7
Meteoroids	16K Spec.	dK' Tronics	Arcade	7
Meteoroids	16K Spec.	Softek	Arcade	6
Micro Prolog	48K Spec.	Sinclair	Language	8
Micropen	16K Spec.	Contrast	Utility	*
Mined Out	16K Spec.	Quicksilva	Arcade	7
Mines of Saturn/Return to Earth	16K Spec.	Mikro-Gen	Adventure	*
Money	16K Spec.	Poppy	Education	*
Monitor/Diss.	48K Spec.	Sinclair	Utility	8
Moon Buggy	16K Spec.	Visions	Arcade	*
Moria	16K Spec.	Severn	Adventure	*
Mountains of Ket	48K Spec.	Incentive	Adventure	*
Muncher	16K Spec.	Silversoft	Arcade	*
Muncher	16K Spec.	Silversoft	Arcade	6
Music Master	48K Spec.	Sinclair	Education	*
Namtir Raiders	16K ZX-81	Artic	Arcade	8
Nanas	16K Spec.	Mikro-Gen	Arcade	*
Night Gunner	16K ZX-81	Digital	Sim.	5
Night Sky	16K Spec.	Bridge	Utility	*
NightFlite	16K Spec.	Hewson	Sim.	5
Nowotnik Puzzle	16K Spec.	Phipps	Game	7
Nowotnik Puzzle	16K ZX-81	Phipps	Game	*
Number 6	16K Spec.	Prime	Education	*
O Level Chemistry	16K ZX-81	Calpac	Education	*
O Level Chemistry	48K Spec.	Calpac	Education	*
O Level French Revision	16K ZX-81	Rose	Education	*
O Level Maths	16K Spec.	Homestudy	Education	*
O Level Maths Revision	16K ZX-81	Rose	Education	*
O Level Physics	16K Spec.	Homestudy	Education	*
O Level Physics	48K Spec.	Think Tank	Education	*
Odds-on	16K Spec.	RSD	Game	*
Oligopoly	48K Spec.	CCS	Strat.	7
Omnicalc	48K Spec.	Microsphere	Business	9
Orbiter	16K Spec.	Silversoft	Arcade	7

Name	Machine	Company	Type	Gilbert factor
Original Superchess	16K ZX-81	CP Software	Trad.	*
Original Superchess	48K Spec.	CP Software	Trad.	*
Ostron	16K Spec.	Softek	Arcade	*
Othello	16K Spec.	CP Software	Trad.	*
Othello	16K Spec.	M.O.I.	Trad.	*
Othello	16K ZX-81	M.O.I.	Trad.	*
Party Time	48K Spec.	C. Tutor	Education	*
Pascal Compiler	48K Spec.	Hi-Soft	Language	*
Pat the Postman	48K Spec.	Mikro-Gen	Arcade	*
Pathfinder	16K Spec.	Widget	Education	*
Payroll	16K ZX-81	Hilderbay	Business	*
Payroll	32K ZX-81	Soft Tech	Business	*
Payroll	48K Spec.	Hilderbay	Business	9
Payroll	48K ZX-81	Soft Tech	Business	*
Peek	16K Spec.	Zen	Utility	*
Penetrator	48K Spec.	Mel. Hse.	Arcade	7
Personal Banking System	16K ZX-81	Hilton	Business	*
Personal Banking System	48K Spec.	Hilton	Business	*
Personal Financ. Management Syst.	48K Spec.	Fulwood	Business	*
Personal Reminder	48K Spec.	SD Micro	Utility	*
Pharoah's Tomb	16K ZX-81	Phipps	Adventure	*
Pilot	16K ZX-81	Hewson	Sim.	7
Pimania	16K ZX-81	Automata	Sim.	*
Pimania	48K Spec.	Automata	Sim.	7
Pinball	16K Spec.	Winters	Game	*
Pirate	48K Spec.	Chalksoft	Education	*
Pitman Seven	16K Spec.	Visions	Adventure	*
Planet of Death	16K Spec.	Artic	Adventure	6
Planetoids	16K Spec.	Sinclair	Arcade	8
Polynomials	16K Spec.	University	Utility	8
Polynomials	16K ZX-81	University	Utility	
Pool	16K Spec.	Bug Byte	Game	7
Pre/early school cassettes	16K Spec.	Essex	Education	*
Primary Arithmetic	16K Spec.	Rose	Education	*
Primary Arithmetic	16K ZX-81	Rose	Education	*
Print Shop	16K Spec.	CCS	Sim.	8
Print Shop	16K ZX-81	CCS	Sim.	*
Print Utilities	16K Spec.	Sinclair	Utility	*
Pro-Golf	16K Spec.	Hornby	Game	7
Programme Enhancement Package	16K ZX-81	R and R	Utility	*
Programmer's Dream	16K Spec.	Work Force	Utility	8
Pssst	48K Spec.	Ultimate	Arcade	7
Puckman	16K ZX-81	Hewson	Arcade	*
Punctuation Pete	16K Spec.	Heinemann	Educational	*
Purchase Ledger	16K ZX-81	Hestacrest	Business	*
Quest	48K Spec.	Hewson	Adventure	6
Quincy	48K Spec.	Severn	Trad.	*
Ramopoly	48K Spec.	J Fletcher	Game	*
Rapedes	16K Spec.	Visions	Arcade	*
Red Weed	48K Spec.	Lothlorian	Simulation	7
Regression	16K Spec.	University	Utility	8
Regression	16K ZX-81	University	Utility	*
Renumber Delete	16K Spec.	Work Force	Utility	*
Renumber Delete	16K ZX-81	Work Force	Utility	*
Repulsar	16K Spec.	Softek	Arcade	*
Rescue	48K Spec.	Computer Rent	Arcade	*
Reversi	16K Spec.	Sinclair	Trad.	8
Rider	16K Spec.	Virgin	Arcade	6
Rommels Revenge	48K Spec.	Crystal	Arcade	8
Roulette	16K Spec.	Newsoft	Trad.	*
Roulette	48K Spec.	Dymond	Trad.	*
Roundsby Incident	48K Spec.	Add-on	Adventure	*
Sales Day Book	16K ZX-81	Transform	Business	*
Sales Day Book	48K Spec.	Transform	Business	*
Sales Ledger	16K ZX-81	Hestacrest	Business	*
Santa	16K Spec.	Artic	Arcade	*
Secret Valley	16K Spec.	Newsoft	Adventure	*
Secret Valley	16K ZX-81	Newsoft	Adventure	*
Security Shelter	48K Spec.	Add-on	Arcade	*
3D Seiddab Attack	48K Spec.	Hewson	Arcade	7
Self-teach Program	16K Spec.	Anvil	Education	*
Self-teach Program	16K ZX-81	Anvil	Education	*
Sentinel	16K Spec.	Abacus	Arcade	7

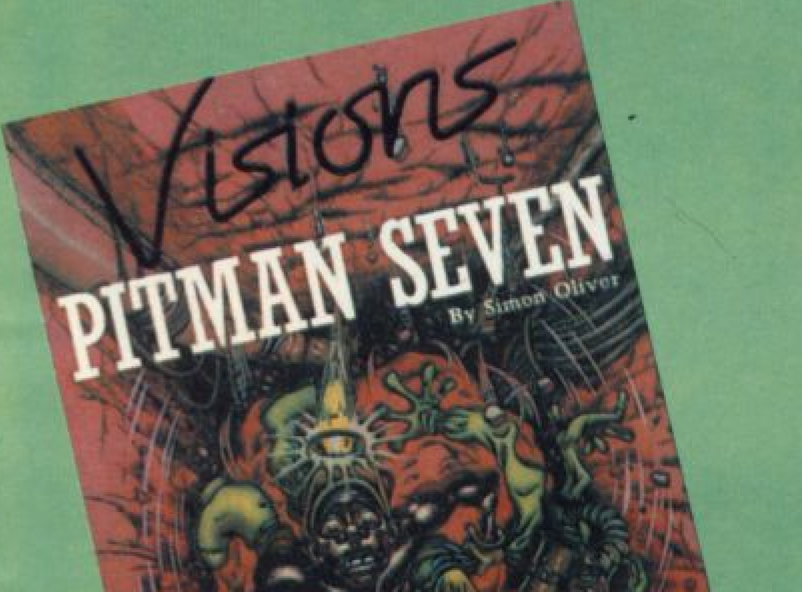
Cassette Round-up

Name	Machine	Company	Type	Gilbert factor
Serpents Tomb	16K ZX-81	Vortex	Adventure	*
Shape Sorter	16K Spec.	Widget	Education	*
Shark Attack	16K Spec.	Romik	Arcade	*
Sheepwalk	48K Spec.	Virgin	Game	7
Sheer Panic	16K Spec.	Visions	Arcade	7
Ship of Doom	48K Spec.	Artic	Adventure	7
Shiva Special 1	16K Spec.	Shiva	Games	*
Shopping List	16K Spec.	SD	Utility	*
Sideways Copy	16K ZX-81	D King	Utility	*
Sky Raider	16K Spec.	C M Smith	Arcade	*
Slippery Sid	16K Spec.	Silversoft	Arcade	8
Slow Loader	16K Spec.	ELR	Utility	9
Snail Logo	48K Spec.	CP	Educ/Lang.	8
Snooker	48K Spec.	Visions	Arcade	*
Softalk 1	48K Spec.	CP	Utility	*
Softalk 2	48K Spec.	CP	Utility	8
Solaris	48K Spec.	Softel	Adventure	*
Solo Whist	16K Spec.	Video Soft.	Trad.	*
Sound FX	16K Spec.	dK' Tronics	Utility	6
Space Fighter	16K Spec.	Winters	Arcade	*
Space Intruders	16K Spec.	QS	Arcade	7
Space Lanes	16K Spec.	Cathedral	Arcade	*
Space Raiders	16K Spec.	Sinclair	Arcade	6
Space Raiders	16K ZX-81	Sinclair	Arcade	*
Space Trek	16K ZX-81	JRS	Arcade	*
Space Zombies	16K Spec.	Mikro-Gen	Arcade	*
Spanish Gold	48K Spec.	Chalksoft	Education	*
Speak and Spell	48K Spec.	S and G	Education	*
Spec. Assembler	48K Spec.	Artic	Utility	*
Spec. Bug	16K Spec.	Artic	Utility	*
Spec. Compiler	48k Spec.	Softek	Utility	7
Spec. Editor/ Assembler	16K Spec.	Picturesque	Utility	8
Spec. Forth	48K Spec.	Abersoft	Language	9
Spec. Forth	48K Spec.	CP	Utility	8
Spec. Frogs/ Showdown	16K Spec.	Artic	Arcade	*
Spec. Gobbleman	16K Spec.		Arcade	*
Spec. Invaders	16K Spec.	Artic	Arcade	*
Spec. Invasion Force	16K Spec.	Artic	Arcade	*
Spec. Microchess	16K Spec.	Artic	Trad.	*
Spec. Monitor	16K Spec.	Picturesque	Utility	8
Spec. Scramble	16K Spec.	Work Force	Arcade	7
Spec. Sound	16K Spec.	M Afzal	Utility	*
Spec. Tape Copier	16K Spec.	S Giza	Utility	*
Special Agent	16K Spec.	Heinemann	Education	*
Spectadraw 2	48K Spec.	McAlley	Utility	*
Spectipede	16K Spec.	R and R	Arcade	8
Spectral Invaders	16K Spec.	Bug-Byte	Arcade	8
Spectral Panic	16K Spec.	Hewson	Arcade	5
Spectres	16K Spec.	Bug-Byte	Arcade	6
Speech Marks	48K Spec.	Sinclair	Education	*
Spellbin	16K Spec.	Startersoft	Education	*
Splat	48K Spec.	Incentive	Arcade	8
Spreadsheet	48K Spec.	Microl	Business	7
Star Gazer	48K Spec.	CRL	Utility	8
3D Star Wars	48K Spec.	Add-on	Arcade	*
3D Strategy	48K Spec.	QS	Mind Game	9
Styx	16K Spec.	Bug-Byte	Arcade	7
Sub	16K Spec.	Romik	Arcade	*
Super Play I	16K Spec.	Video	Games	*
Superchess II	48K Spec.	CP	Trad.	8
Supercode	16/48K Spec.	CP	Utility	*
Superspy	48K Spec.	Shepherd	Adventure	5
Swag + Voyager	16K ZX-81	Howard	Arcade	*
Tai	16K ZX-81	PSS	Game	*
Tank Battle	16K Spec.	dK' Tronics	Game	8
Tape Breaker	16K Spec.	Spectrasoft	Utility	*
Tape Copier	16K Spec.	Lerm	Utility	*
Taswide-64	16K Spec.	Tasman	Utility	*
Tasword	48K Spec.	Tasman	Business	8
Tasworld II	48K Spec.	Tasman	Business	9
Teach Data	48K Spec.	B Farris	Education	*
Teacher Data	48K Spec.	B Farris	Education	8
Teacheraid	16K Spec.	B Farris	Education	*
Tennis	16K Spec.	Winters	Game	*
Tenpin	16K ZX-81	Phipps	Game	*
Terror from The Deep	48K Spec.	Add-on	Adventure	*
Test Match	48K Spec.	Computer Ren.	Sim.	*
The Castle	48K Spec.	Bug Byte	Adventure	*
The Devil Rides In	16K Spec.	Carnell	Arcade	*
The Forest	48K Spec.	Phipps	Sim.	*
The Great Western	16K Spec.	New Soft	Game	*
The Great Western	16K ZX-81	New Soft	Game	*
The Key	16K Spec.	Keysoft	Utility	*
The Orb	48K Spec.	Computer Ren.	Adventure	*
The Pyramid	48K Spec.	Fantasy	Arcade	7
The Settler	16K Spec.	BSS	Utility	*
The Settler	16K ZX-81	BSS	Utility	*
The Turk	48K Spec.	OCP	Trad.	8
Time Bandits	16K Spec.	New Soft	Adventure	*
Time Bandits	16K ZX-81	New Soft	Adventure	*
Time Gate	48K Spec.	QS	Arcade	8
Time Quest	48K Spec.	Mikro-Gen	Adventure	*
Tobor	48K Spec.	Add-on	Arcade	7
Tomb of Dracula	16K ZX-81	Felix	Adventure	*
Tomb of Dracula	48K Spec.	Felix	Adventure	*
Trace	16K Spec.	Zen	Utility	*
Trace	16K Spec.	Texgate	Utility	8
Tradewind	48K Spec.	WDS	Strat.	*
Train Game	16K Spec.	Microsphere	Game	9
Transylvanian Tower	48K Spec.	Shepherd	Adventure	7
Tranz Am	48K Spec.	Ultimate	Arcade	*
Traxx	48K Spec.	QS	Arcade	7
Troon	48K Spec.	Hornby	Game	8
Tube Train Terror	48K Spec.	JRS	Game	*
3D Tunnel	48K Spec.	New Gen.	Arcade	9
Urban Upstart	48K Spec.	Shepherd	Adventure	*
Use and Learn	16K Spec.	Microl	Utility	8
Utility File	48K Spec.	SD Micro	Business	*
Valhalla	48K Spec.	Movisoft	Adventure	7
Vampire Village	48K Spec.	Terminal	Adventure	4
Velnor's Lair	48K Spec.	QS	Adventure	8
Voice Chess	48K Spec.	Artic	Trad.	9
Volcanic Dungeon	16K ZX-81	Carnell	Adventure	*
Volcanic Dungeon	48K Spec.	Carnell	Adventure	6
Vu-Calc	16K Spec.	Sinclair	Business	7
Vu-File	16K Spec.	Sinclair	Business	8
Vu3D	48K Spec.	Sinclair	Utility	8
War 70	48K Spec.	CCS	Strat.	8
Warlock of Firetop Mountain	48K Spec.	Penguin	Arcade	*
Warlord	48K Spec.	Lothlorian	Sim.	*
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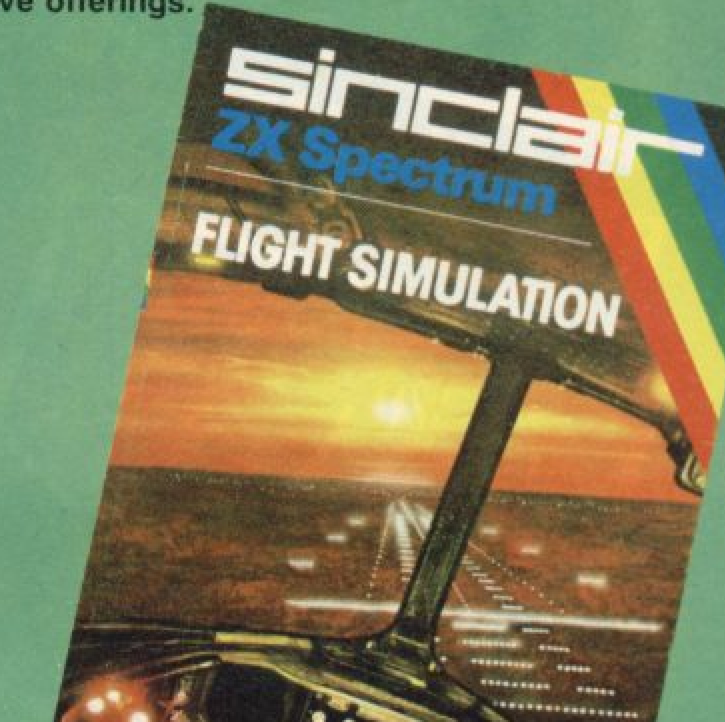

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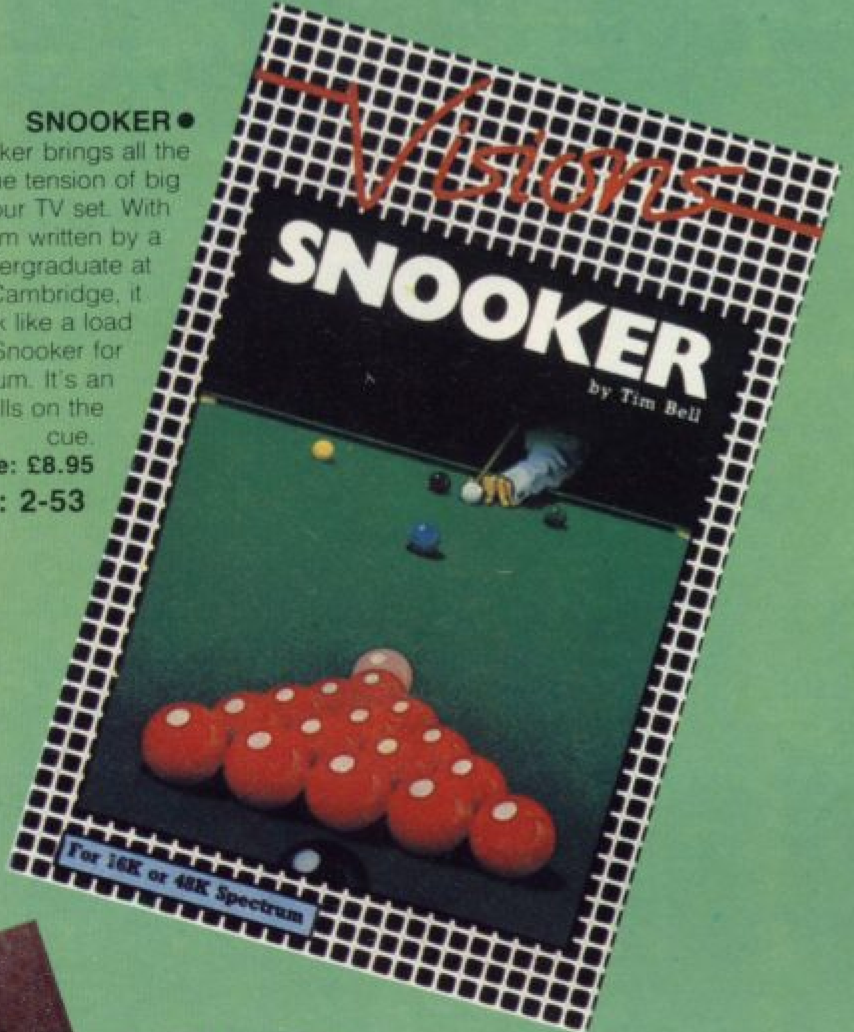
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